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# Administrative Bulletins of the University of California

1918-19. No. 2

## ORGANIZATION OF THE UNIVERSITY

The University of California is an integral part of the public educational system of the State. As such it completes the work begun in the public schools. Through aid from the State and the United States, and by private gifts, it furnishes instruction in literature and in science, and in the professions of engineering, art, law, medicine, dentistry, and pharmacy. In the Colleges of Letters and Science, Commerce, Agriculture, Mechanics, Mining, Civil Engineering, and Chemistry these privileges are offered without charge for tuition to all residents of California who are qualified for admission. Non-residents of California are charged a tuition fee of \$10 each half-year. In the professional colleges, except that of Law, tuition fees are charged. The instruction in all the colleges is open to all qualified persons, without distinction of sex. The Constitution of the State provides for the perpetuation of the University, with all its departments.

## CIRCULARS OF INFORMATION

Letters of inquiry concerning the College of Agriculture should be addressed to the *Dean of the College of Agriculture, Berkeley, California.*

For the following circulars of information concerning the several colleges and departments of the University apply to the *Recorder of the Faculties, University of California, Berkeley, California.*

The Circular of Information, Academic Departments (Colleges of Letters and Science, Agriculture, Commerce, and Engineering, and the first two years of Medicine). Containing general information about the University, its organization, government, faculties, requirements for admission to undergraduate status, requirements for bachelors' degrees, and expenses. Detailed information is given in the other publications mentioned in this list.

The Announcement of the Graduate Division.

The Annual Commencement Programme. Containing the list of degrees conferred, scholarships, prizes, and other honors.

Specimen entrance examination papers.

The Annual Announcement of Courses of Instruction in the Academic Departments. Price, 10 cents. Sent by mail by the Recorder of the Faculties for 15 cents.

(Continued on third page of cover)

UNIVERSITY OF CALIFORNIA

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ANNOUNCEMENT  
OF  
COURSES OF INSTRUCTION

IN THE COLLEGES OF LETTERS AND SCIENCE,  
COMMERCE, AGRICULTURE, MECHANICS,  
MINING, CIVIL ENGINEERING, AND CHEMISTRY

THE SCHOOLS OF  
ARCHITECTURE, EDUCATION, AND JURISPRUDENCE

AND THE FIRST AND SECOND YEARS OF  
THE MEDICAL SCHOOL

FOR THE ACADEMIC YEAR 1918-19

UNIVERSITY OF CALIFORNIA PRESS  
BERKELEY

1918



## CLASSIFICATION AND NUMBERING OF COURSES

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### CLASSIFICATION.

#### I. UNDERGRADUATE COURSES.

1. *Lower Division Courses.*
2. *Free Elective Courses.*
3. *Upper Division Major Courses.*

A major course is an upper division course of advanced work in a department of study that has been pursued in the lower division, or of elementary work in a subject of such difficulty as to require the maturity of upper division students. All major courses are definitely announced as such, and are given the numbers 100-199, as is explained below.

#### II. GRADUATE COURSES.

### NUMBERING.

Excepting only the major courses, *all undergraduate courses*, whether in the lower or upper division, are numbered from 1 to 99, inclusive.

*Undergraduate major courses* are numbered from 100 to 199, inclusive. *Graduate courses* are numbered from 200 to 299, inclusive.

*Year Courses; Double Numbers.* A course designated by a double number (for example, History 1A-1B) is continued through two successive half-years, that is, from August to May (in 1918-19, September to June), or from January to December. The student will use the first number in registering for the course during its first half-year, and the second number during its second half-year. A *final* report will be made by the instructor at the end of each half-year; "provisional mid-year reports" in year courses have been discontinued. The student may discontinue the course at the end of the first half-year, with final credit for the first half of the course.

### CREDIT VALUATION OF COURSES

In the ANNOUNCEMENT OF COURSES the credit value per half-year for every course is indicated. It is to be understood that the number of units agrees with the number of "hours" except where otherwise stated.

## THE UNIVERSITY LIBRARY

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The University Library building, provided by the bequest of the late Charles F. Doe, was first occupied in June, 1911, at the opening of the Summer Session. The library at present contains over 340,000 volumes. A collection of about 12,000 volumes, chiefly reference books and general literature has been accumulated on open shelves in the large reading room, free of access to all students; in addition, the Reserved Book Room, housing the assigned readings, and the seminar rooms, in which special collections on various subjects are installed, provide accommodations for both undergraduate and more advanced workers.

Among the more important special collections may be mentioned the Bancroft Library of west American history, which is unique in its field, and the Weinhold collection on Germanic philology and folklore. The law library of something over 20,000 volumes is separately housed in the Boalt Hall of Law.

The current serials and periodicals, amounting to considerably over 7,000 titles, are kept in a special room of the University Library. Much unusual material, especially in the field of foreign scientific publications, is received in exchange for the publications of the University and is included here.

The resources of the library are supplemented by an inter-library loan system, and information as to the resources of certain other large libraries, which can be drawn upon when necessary, is provided by the depository catalogue. This contains the printed cards of the Library of Congress, the University and the John Crerar libraries in Chicago, and the Harvard University Library, as well as cards on special subjects published by the Royal Library in Berlin.

Copies of the University Library handbook may be obtained on application to the librarian.

# COURSES OF INSTRUCTION OFFERED IN THE COLLEGES AT BERKELEY FOR THE ACADEMIC YEAR, 1918-19

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## AGRICULTURE

THOMAS F. HUNT, D.Agr., Sc.D., Professor of Agriculture, Dean of the College of Agriculture and Director of the Agricultural Experiment Station.

EDWARD J. WICKSON, M.A., Professor of Horticulture, Emeritus.

HUBERT E. VAN NORMAN, B.S., Professor of Dairy Management, Vice-Director of Agricultural Experiment Station, and Dean of University Farm School.

HERBERT J. WEBBER, Ph.D., D.Agr., Professor of Plant Breeding, Director of the Citrus Experiment Station, and Dean of the Graduate School of Tropical Agriculture.

MYER E. JAFFA, M.S., Professor of Nutrition.

\*CHARLES W. WOODWORTH, M.S., Professor of Entomology.

RALPH E. SMITH, B.S., Professor of Plant Pathology.

J. ELIOT COIT, Ph.D., Professor of Citriculture.

CHARLES F. SHAW, B.S., Professor of Soil Technology.

JOHN W. GREGG, B.S., Professor of Floriculture and Landscape Gardening.

JOHN W. GILMORE, M.S., Professor of Agronomy.

FREDERIC T. BIOLETTI, M.S., Professor of Viticulture and Enology.

WARREN T. CLARKE, B.S., Professor of Agricultural Extension and Superintendent of Farmers' Institutes.

JOHN S. BURD, B.S., Professor of Agricultural Chemistry.

CHARLES B. LIPMAN, Ph.D., Professor of Soil Chemistry and Bacteriology.

\*CLARENCE M. HARING, D.V.M., Professor of Veterinary Science.

\*ERNEST B. BABCOCK, M.S., Professor of Genetics.

GORDON H. TRUE, B.S., Professor of Animal Husbandry, Davis.

JAMES T. BARRETT, Ph.D., Professor of Plant Pathology in the Citrus Experiment Station and Graduate School of Tropical Agriculture, Riverside.

FRITZ W. WOLL, Ph.D., Professor of Animal Nutrition, Davis.

WALTER MULFORD, F.E., Professor of Forestry; Acting Dean of the College of Agriculture, Acting Director of the Agricultural Experiment Station.

WALTER P. KELLEY, Ph.D., Professor of Agricultural Chemistry in the Citrus Experiment Station and Graduate School of Tropical Agriculture, Riverside.

\*DAVID T. MASON, M.F., Professor of Forestry.

\* In residence second half-year only; \* absent on leave for the duration of the war.

HENRY J. QUAYLE, M.S., Professor of Entomology in the Citrus Experiment Station and Graduate School of Tropical Agriculture, Riverside.

ELWOOD MEAD, D.Eng., Professor of Rural Institutions.

HOWARD S. REED, Ph.D., Professor of Plant Physiology in the Citrus Experiment Station and Graduate School of Tropical Agriculture, Riverside.

JAY B. DAVIDSON, M.E., A.E., Professor of Agricultural Engineering, Davis.

FRANK ADAMS, M.S., Professor of Irrigation Investigations.

CHESTER L. ROADHOUSE, D.V.M., Professor of Dairy Industry, Davis.

LEON D. BATCHELOR, Ph.D., Professor of Plant Breeding in the Citrus Experiment Station and Graduate School of Tropical Agriculture, Riverside.

CHARLES H. SHATTUCK, Ph.D., Professor of Forestry.

HOWARD S. FAWCETT, M.S., Professor of Plant Pathology in the Citrus Experiment Station and Graduate School of Tropical Agriculture, Riverside.

WALTER L. HOWARD, Ph.D., Professor of Pomology, Davis.

JAMES C. WHITTEN, Ph.D., Professor of Pomology.

\*WILLIAM G. HUMMEL, M.S., Professor of Agricultural Education.

WILLIAM T. HORNE, B.S., Associate Professor of Plant Pathology.

ERWIN J. LEA, M.S., Associate Professor of Nutrition.

\*WILLIAM B. HERMS, M.A., Associate Professor of Parasitology.

JOHN E. DOUGHERTY, B.S., Associate Professor of Poultry Husbandry, Davis.

BERTRAM H. CROCHERON, M.S.A., Associate Professor of Agricultural Extension.

GEORGE H. HART, M.D., D.V.M., Associate Professor of Veterinary Science.

PATRICK B. KENNEDY, Ph.D., Associate Professor of Agronomy.

RICHARD L. ADAMS, M.S., Associate Professor of Agronomy.

STANLEY S. ROGERS, B.S., Associate Professor of Olericulture, Davis.

SAMUEL H. BECKETT, B.S., Associate Professor of Irrigation Practice, Davis.

FREDERICK L. GRIFFIN, Associate Professor of Agricultural Education.

JOHN I. THOMPSON, B.S.A., Assistant Professor of Animal Husbandry, Davis.

BEN A. MADSON, B.S.A., Assistant Professor of Agronomy, Davis.

WALTER E. PACKARD, M.S., Assistant Professor of Agricultural Extension.

FRED M. HAYES, D.V.M., Assistant Professor of Veterinary Science, Davis.

WILLIAM V. CRUESS, B.S., Assistant Professor of Zymology.

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\* Absent on leave, 1918-19.

\* Absent on leave for the duration of the war.



- JAMES W. NELSON, B.S., Assistant Professor of Soil Technology.  
LESLIE T. SHARP, B.S., Assistant Professor of Soil Chemistry and Bacteriology.  
DENNIS R. HOAGLAND, M.A., Assistant Professor of Agricultural Chemistry.
- \*GUY R. STEWART, B.S., Assistant Professor of Agricultural Chemistry.  
O. J. KERN, Assistant Professor of Agricultural Education.
- \*RALPH T. STEVENS, B.S., Assistant Professor of Landscape Gardening and Floriculture.
- \*ROLAND S. VAILE, A.B., Assistant Professor of Orchard Management in the Citrus Experiment Station and Graduate School of Tropical Agriculture, Riverside.
- ROBERT F. MILLER, M.S., Assistant Professor of Animal Husbandry, Davis.  
JACOB TRAUM, D.V.M., Assistant Professor of Veterinary Science.  
WOODBRIIDGE METCALF, M.S., Assistant Professor of Forestry.  
T. FRANCIS HUNT, B.S., Assistant Professor of Agricultural Extension and Assistant Superintendent of Farmers' Institutes.  
ELIZABETH H. SMITH, M.S., Assistant Professor of Plant Pathology.  
RALPH H. TAYLOR, B.S., Assistant Professor of Pomology.  
EDWIN C. VAN DYKE, M.D., Assistant Professor of Entomology.  
IRA J. CONDIT, B.S., Assistant Professor of Citriculture.
- \*DONALD BRUCE, M.F., Assistant Professor of Forestry.
- \*HENRY A. MATTILL, Ph.D., Assistant Professor of Nutrition.
- \*WILLIAM F. GERICKE, M.S., Assistant Professor of Soil Chemistry.  
ALFRED SMITH, M.A., Assistant Professor of Soil Technology.
- \*ROY E. CLAUSEN, Ph.D., Assistant Professor of Genetics.  
EDWARD O. ESSIG, M.S., Assistant Professor of Entomology.  
VIRGIL C. BRYANT, M.S., Assistant Professor of Agricultural Extension.  
CHESTER W. RUBEL, B.S.A., Assistant Professor of Agricultural Extension.  
GEORGE P. GRAY, M.S., Assistant Professor of Entomology and Chemist in Insecticide Laboratory.
- \*HARRY S. BAIRD, B.S., Assistant Professor of Dairy Industry, Davis.  
GEORGE W. HENDRY, B.S., Assistant Professor of Agronomy.
- \*ARTHUR H. HENDRICKSON, B.S., Assistant Professor of Pomology (Exchange Professor at Cornell University, 1918-19).  
WARREN P. TUFTS, M.S., Assistant Professor of Pomology, Davis.  
PAUL L. HIBBARD, B.S., Assistant Professor of Agricultural Chemistry.  
WILLIAM H. HEILEMAN, M.S., Assistant Professor of Agricultural Extension.
- WILLIAM W. MACKIE, M.S., Assistant Professor of Agronomy.  
JOE G. MOODEY, B.S., Assistant to the Director; Assistant Professor of Agriculture.

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\* Absent on leave, 1918-19.

\* Absent on leave for the duration of the war.

THOMAS TAVERNETTI, B.S., Assistant Professor of Farm Practice, and Assistant to the Dean, University Farm School, Davis.

WALTER W. WEIR, Assistant Professor of Soil Technology.

FRANK J. VEIHMEYER, B.S., Assistant Professor of Irrigation Investigations.

FRIEDRICH C. H. FLOSSFEDER, Assistant Professor of Viticulture and Superintendent of Grounds at University Farm, Davis.

EARLE L. OVERHOLSER, M.A., Assistant Professor of Pomology (Exchange Professor from Cornell University, 1918-19).

\*STANLEY B. FREEBORN, B.S., Assistant Professor of Entomology.

CLIFFORD F. ELWOOD, B.S., Assistant Professor of Agricultural Extension.

\*EDWIN C. VOORHIES, B.S., Assistant Professor of Animal Husbandry, Davis.

WYLLIE E. LLOYD, B.S., Assistant Professor of Poultry Husbandry, Davis.

LEONARD J. FLETCHER, B.S., Assistant Professor of Agricultural Engineering, Davis.

HARRIET G. EDDY, A.B., Assistant Professor of Agricultural Extension.

GEORGE A. COLEMAN, M.A., Instructor in Entomology and Curator of the Agricultural Museum.

HUBERT L. BELTON, Instructor in Shopwork, Davis.

ROSS C. INGRIM, Instructor in Shopwork, Davis.

CLAYTON O. SMITH, M.A., Instructor in Plant Pathology, Riverside.

DANIEL H. CAREY, B.S., Instructor in Floriculture and Superintendent of Greenhouses and Gardens.

HOWARD B. FROST, Ph.D., Instructor in Plant Breeding in the Citrus Experiment Station and Graduate School of Tropical Agriculture, Riverside.

STEPHEN L. DENNING, B.S., Instructor in Dairy Industry, Davis.

HENRY H. SEVERIN, Ph.D., Instructor in Entomology.

WALTER C. DEAN, B.S., Instructor in Soil Technology.

ELMER R. DE ONG, B.S., Instructor in Entomology.

WILLIAM L. SWEET, M.S., Instructor in Pomology.

J. RAYMOND BEACH, D.V.M., Instructor in Veterinary Science, Davis.

PETER T. PETERSEN, D.V.M., Instructor in Veterinary Science, in charge of serum manufacture.

ROBERT W. HODGSON, B.S., Instructor in Citriculture.

HELEN I. MATTILL, Ph.D., Instructor in Nutrition.

DEAN D. WAYNICK, Ph.D., Instructor in Soil Chemistry and Bacteriology.

GUY L. PHILP, B.S., Instructor in Pomology, Davis.

\*ARTHUR W. CHRISTIE, M.S., Instructor in Agricultural Chemistry.

KATHERINE JONES, B.S., Instructor in Landscape Gardening and Floriculture.

JULIUS L. COLLINS, B.S., Instructor in Genetics.

J. C. MARTIN, B.S., Instructor in Agricultural Chemistry.

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\* Absent on leave for the duration of the war.

FRANCIS W. ALBRO, B.S., Assistant in Nutrition.  
J. C. MARQUARDT, B.S., Assistant in Dairy Husbandry, Davis.  
\*G. F. FERMERY, Assistant in Agricultural Engineering, Davis.  
WALTER W. WOBUS, B.S., Assistant in Agricultural Education.  
MILO N. WOOD, B.S., Assistant in Pomology, Davis.  
WALTER S. WILKINSON, B.S., Assistant in Agronomy, El Centro.  
BLYTHE F. MONROE, B.S., Assistant in Soil Technology.

*Upper Division Courses.*—All upper division courses announced by this department presuppose at least junior standing in the College of Agriculture. Students in other colleges may elect such courses in the department of agriculture as they are qualified to pursue.

*Honors.*—Students who become candidates for the bachelor's degree may be recommended for honors on the basis of the quality of the work done in the regular curriculum of the senior year or its equivalent, or on the basis of a thesis showing ability to do original work.

*Practice Courses.*—Every student is required to complete a practice course in the subject which he elects for his major study. The object of these courses is to give the students an insight into the actual practice of his chosen occupation. The practice courses consist of two general lines of work: (1) technical, instructional courses carrying 6 units credit, and (2) practical work on a farm, in a laboratory, factory, or other commercial enterprise, carrying no university credit. Students who take the latter work (2) are required to offer, in addition, 6 units chosen from any university department in order to make up the 130 units required for graduation.

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\* Absent on leave for the duration of the war.

**AGRICULTURAL CHEMISTRY**

1. General Agricultural Chemistry. (BURD)  
The relation of chemistry to agriculture. Lectures.  
3 hrs., first half-year. Tu Th 8, 9. Prerequisite: Chemistry 1A-1B.  
Prescribed for sophomores in the College of Agriculture.
2. Agricultural Laboratory. (BURD, CHRISTIE, and MARTIN)  
Experiments with and laboratory tests of agricultural materials.  
6 hrs., first half-year; 2 units. Sec. I, M F, 1-4; Sec. II, Tu Th, 1-4.  
Prerequisite: Chemistry 1A-1B. Prescribed concurrently with course  
1 for sophomores in the College of Agriculture.
- 101A-101B. Advanced Agricultural Chemistry. (HOAGLAND)  
The technical application of chemical principles to agricultural phenomena and problems; complete and proximate analysis of materials of agricultural interest; choice of methods, limits of permissible error, interpretation of results.  
7 hrs., throughout the year; 3 units each half-year. Lecture to be arranged; laboratory, first half-year, Tu Th, 1-4; second half-year, Tu Th, 2-5. Prerequisite: Chemistry 5 or 6A-6B and 8 (6A-6B recommended; 8 may be taken concurrently). Required for the major in agricultural chemistry.
102. The Chemistry of Fertilizers. (HIBBARD)  
The relations of fertilizers to plants and soils; chemical examination with reference to agricultural and commercial evaluation; correlation of chemical properties and physical texture with availability.  
6 hrs., second half-year; 2 units. Lectures and discussions as required. Laboratory, Tu Th, 9-12. Prerequisite: courses 1 and 2; Chemistry 5 or 6A-6B. Required for the major in agricultural chemistry and soils.
103. Laboratory Study of Selected Topics. (HOAGLAND)  
Continuation of course 101A-101B. Prerequisite to thesis course.  
6 hrs. laboratory, 1 hr. lecture and discussion, first half-year; 3 units.  
Prerequisite: course 101A-101B. Required for the major in agricultural chemistry.
- 104A-104B. Pro-seminar. (BURD and HOAGLAND)  
Discussion of literature and papers prepared by members of the class.  
2 hrs. bi-weekly, throughout the year; 1 unit each half-year. Hours to be arranged. Required in the junior and senior years for the major in agricultural chemistry. Elective to those taking course 101A-101B.
105. Thesis Course. (Instructor in charge of Thesis)  
4 units. Hours to be arranged. Prerequisite: course 103.
201. Research. (BURD)  
Hours to be arranged.

**AGRICULTURAL EDUCATION**

5. Agencies for Rural Progress. (KERN)  
Country life problems, agencies for rural progress, and the best means of utilizing those agencies for the improvement of rural communities. Lectures, assigned readings, and reports.  
3 hrs., second half-year. M Tu W, 9.
99. Practice Course.  
Students should consult the head of the division.
100. Elements of Agricultural Nature Study and School Gardens. (KERN)  
Aims, methods and materials used in agricultural instruction in the elementary school. Suggestions to meet the requirement of the California school law. The educational and economic values of the school-directed garden; the home project in agricultural education. Practical garden work on the campus.  
5 hrs., either half-year; 3 units. Lectures, M Tu, 1; laboratory, W, 1-4.
101. High School Farms, Gardens, and Community Work. (HUMMEL)  
Lectures, reports, and conferences on the utilization of land in connection with agricultural teaching; means by which the facilities of a school can be brought into intimate and helpful relation with the agricultural interests and home life of the community supporting the school; practice in planning and executing school farm problems and demonstrations.  
5 hrs., second half-year; 3 units. Lectures, M W, 11; laboratory, F, 1-4. Prerequisite: senior standing.
102. General Science and First-year Agriculture. (HUMMEL)  
The aims and values of a general science course in the high school, comparative study of typical courses, and exposition of the peculiar adaptations to the general science work of an elementary agricultural course in which plant study forms the basis of continuity. The equipment, nature, and amount of practical work needed in the course, including field trips and excursions, outdoor and laboratory exercises, will be considered in detail.  
3 hrs., first half-year. M W F, 2.
104. Agriculture in Secondary Schools. (HUMMEL)  
Agricultural teaching, including its history, the teaching methods to be employed and the equipment needed. A general consideration of the educational aims and values of the work and of the organization of the course is followed by a detailed study of materials and methods involved in the teaching of elementary agriculture, dairying, animal husbandry, horticulture, etc. Lectures, readings, and assigned practicums.  
3 hrs., first half-year. M W F, 10. Prerequisite: senior standing.

## 12      *Agriculture—Agricultural Education; Agronomy*

### 105. Rural School Administration. (KERN)

The chief function of the rural school. The fundamentals of successful school management. Socialization of the rural school as to curriculum and community relations. The spirit of the teacher. Standardization of the educational plant. Survey of modern forward movements in rural school betterment. Consolidation of schools and its relation to the new country life. Readings from country life literature. Illustrated lectures on school improvement.

3 hrs., first half-year. M Tu W, 9.

### 115. Individual Study of Selected Topics in Agricultural Education. (HUMMEL and KERN)

Either half-year. Hours to be arranged.

### 120A-120B. Pro-seminar. (HUMMEL and KERN)

2 hrs., throughout the year. Tu, 3-5.

### 125. The Practice of Teaching Agriculture. (HUMMEL)

A five weeks' practice course in selected high schools of the state. Making of lesson plans, practice teaching, reports and conferences with supervising teacher and instructor. Supervised practice teaching and observation of methods and management of class and laboratory instruction by the local teacher. By arrangement with the Department of Education this course may be accepted in satisfaction of the requirement in practice teaching for the high school teacher's recommendation.

To begin immediately after the close of the second half-year; 4 units.  
Prerequisite: courses 102 and 104 and Education 223.

### 202. Special Studies in Agricultural Education. (HUMMEL and KERN)

Either half-year. Hours to be arranged.

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## AGRONOMY

### 99. Practice Course. (ADAMS and HENDRY)

Methods of crop production and farm management, with practice work. Trips into the surrounding country.

Six weeks. Daily, except Sunday, beginning the day after Commencement; 6 units.

(Given at Berkeley)

### 103. Seeds. (KENNEDY)

Morphology and relationship of seeds, impurities, germination. Special attention will be given to seeds of economic importance.

4 hrs., second half-year; 2 units. Lecture, Th, 1; laboratory, Th, 2-5.

**\*104. Weeds.**

(KENNEDY)

The appearance, habits, and problems of the more common weeds in their relation to agriculture. Lectures and demonstrations.

2 hrs., second half-year.

**106. Cereals**

(HENDRY)

The cereals of America with special reference to California and Pacific Coast conditions. It is highly desirable that the student should have finished Botany 3 before entering upon the course.

5 hrs., first-half year; 3 units. Lectures, Tu Th, 9; laboratory, Tu, 2-5.

**108. Agrostology.**

(KENNEDY)

Morphology and taxonomy of grasses and legumes in their relations to agriculture.

5 hrs., second half-year; 3 units. Lectures, Tu Th, 9; laboratory, Tu, 2-5. Prerequisite: Botany, 2, 3, and 104b.

**118. Farm Management.**

(ADAMS)

The business aspects of land management. The relation of capital, choice of land, farm equipment, farm layout, cropping systems, labor; marketing and farm accounts to specific agricultural industries, both special and general. The correlation and application of agricultural principles to specific problems. Open only to seniors.

5 hrs., first half-year; 3 units. Lectures, W F, 9; laboratory, F, 2-5.

**119. Farm Management.**

(ADAMS)

Advanced and special problems supplementing course 118. Open only to seniors.

4 hrs., first half-year; 2 units. M, 1-5.

**120. Crop Production.**

(GILMORE)

Field practice and experimental methods of crop production, crop management, maintenance of fertility, and miscellaneous crops. Lectures, assigned readings, and problems.

3 hrs., second half-year. Tu Th S, 10. Prerequisite: Soil Technology 1.

**130. Conference—Special Topics.**

(GILMORE and STAFF)

Presentation of reports and papers with discussions on subjects assigned. Open only to seniors.

2 hrs., first half-year; 1 unit. W, 2-4.

**131A-131B. Thesis.**

(GILMORE and STAFF)

Study of literature with laboratory or field investigations on problems assigned.

Throughout the year; 1 to 2 units each half-year.

\* Not to be given, 1918-19.

14      *Agriculture—Agronomy; Animal Husbandry*

200. Advanced Agronomy. (GILMORE)  
Original investigation of problems in crop production.  
Either half-year. Hours to be arranged.
201. Advanced Agrostology. (KENNEDY)  
Original investigation of forage crops and problems.  
Either half-year. Hours to be arranged.
202. Advanced Farm Management. (ADAMS)  
Original investigation of problems in farm management.  
Either half-year. Hours to be arranged.
- (Given at Davis)
100. Advanced Practice. (MADSON)  
Practice and correlated problems in crop production as conducted in  
the field with experimental plots.  
9 hrs., second half-year; 3 units. Hours to be arranged.
107. Forage Crops. (KENNEDY)  
The plants which produce feed for live-stock: their characteristics,  
adaptations and culture methods; the principles underlying the  
maintenance of meadows, pastures and ranges. Lectures and dem-  
onstrations.  
5 hrs., second half-year; 3 units. M, 11; Tu, 9; M, 1-4.
111. Field Practice. (MADSON and HENDRY)  
Field studies with work on tabulation and correlation of operations  
and results. Various types and varieties of field crops and the  
cultural methods involved in their production.  
9 hrs., second half-year; 3 units. W F, 1-5:30.

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**ANIMAL HUSBANDRY**

99. Practice in Animal Husbandry. (TRUE and STAFF)  
Summer practice course at the University Farm for students with a  
major in animal husbandry. Work adapted to individual needs.  
6 weeks beginning the day after Commencement. 6 units.
- (Given at Berkeley)
100. Farm Animals—General Course. (TRUE)  
The breeds, care, and management of farm animals. Especially for  
students who have not a major in animal husbandry.  
3 hrs., first half-year. M Tu W, 4.



(Given at Davis)

101. Management of Farm Animals. (MILLER)  
The care and management of horses, beef cattle, dairy cattle, sheep and hogs; lectures and practice work in the feeding and care of animals at the barn and fitting stock for exhibition purposes.  
2 lectures and 2 laboratory periods; 4 units. One laboratory period will include stable practice with the different classes of live stock at the University Farm.
102. Feeding of Farm Animals. (MILLER)  
A study of the common feed stuffs and their uses with respect to horses, beef cattle, dairy cattle, sheep and hogs.  
4 hrs., second half-year.
105. Dairy Cattle and Hogs. (TRUE and THOMPSON)  
Lectures on the origin, history and development of breeds; practice work in judging.  
6 hrs., second half-year; 4 units. Lectures, M Th, 8; laboratory, M Th, 9-11.
106. Beef Cattle, Horses and Sheep. (THOMPSON and MILLER)  
A continuation of course 105.  
6 hrs., second half-year; 4 units. Lectures, M Th, 8; laboratory, M Th, 9-11.
107. Breeding Farm Animals. (THOMPSON)  
The application of the principles of heredity, atavism, reversion, inbreeding, line breeding, etc., to the practice of breeding farm animals. Lectures, recitations, discussions.  
3 hrs., second half-year. Tu W Th, 9.
108. Milk Production. (VOORHIES)  
Lectures and recitations on the types of dairies, advanced registry systems, dairy laws and inspection, calf raising, plans for dairy buildings; discussion of the milch goat industry.  
3 hrs., second half-year. Tu Th F, 11.
109. Pro-seminar. (TRUE)  
Bi-weekly topics and discussions of special problems in animal breeding.  
2 hrs., second half-year; 1 unit.
110. Pro-seminar. (WOLL)  
Bi-weekly topics and discussions of special problems in animal feeding.  
2 hrs., second half-year; 1 unit.

**CITRICULTURE****99. Practice Course.**

(CONDIT)

A traveling practice course in citrus and other semi-tropical fruits, designed to bring the student into active contact with the great fruit industries of the state and to give him some actual practice in as many of the operations of fruit production as practicable.

Six weeks. Daily, except Sunday, beginning about the middle of May; 6 units. This course or its equivalent is required for graduation of those specializing in citriculture. Prerequisite: two years' study in a university or college course.

**101. Citrus Fruits.**

(CONDIT)

Propagation, location and management of orchards, orchard heating, harvesting, packing, storing, marketing, and pest control. Lectures, assigned readings, and reports.

4 hrs., second half-year. Tu Th S, 8; Th, 4.

**102. Semi-Tropical Fruits.**

(CONDIT)

Semi-tropical fruits grown in California, including the olive, date, fig, avocado, guava, loquat, mango, feijoa, and others. Classification, morphology, propagation, culture, harvesting, packing, etc. Lectures, assigned readings, and laboratory work.

6 hrs., first half-year; 4 units. Lectures, Tu Th S, 11; laboratory, Tu, 2-5.

**103. Pro-seminar.**

(CONDIT)

Assigned special topics requiring extended research into pomological literature. Reports and discussions. Required of and limited to regular and graduate students who elect citriculture as their major subject.

2 hrs., either half-year. M, 3-5.

**104. Citrus Investigations.**

(CONDIT)

3 or 6 hrs., either half-year; 1 or 2 units. Hours to be arranged. Prerequisite: senior standing in the College of Agriculture.

**105. Advanced Citrus Fruits.**

(CONDIT)

Classification, morphology and chemistry of citrus fruits. History and status of citrus industry in United States and foreign countries. Lectures, written reports, and laboratory work.

5 hrs., second half-year; 3 units. Lectures, Tu Th, 11; laboratory, Tu, 2-5. Prerequisite: course 101, completed or in progress.

**\*106. Physiology and Anatomy of Citrus and Semi-tropical Fruit Plants.**

(HODGSON)

The practical application of the principles of plant physiology and anatomy to the common problems of fruit production, transportation, and storage.

7 hrs., second half-year; 3 units. Lectures, M, 2; laboratory, W F, 2-5. Prerequisite: Chemistry 1A-1B; Botany 2 and 3.

Fruit and Vegetable Products. (See Viticulture 112, 115). (CRUESS)

\* Not to be given, 1918-19.

201A-201B. Laboratory or Field Research.

(CONDIT)

Topics for research in citrus or semi-tropical fruits. Open to graduate students desiring to write theses.

Throughout the year; hours to be arranged. Prerequisite: courses 101, 102, 103, and 105, or equivalent training. For further particulars, see Announcement of the Graduate Division.

### DAIRY INDUSTRY

99. Practice in Dairying.

Dairy manufactures, market milk, dairy production. May be taken at the University Farm in the creamery, or at the dairy barns, or in any other creamery, milk plant or dairy farm approved by the division. May be taken after either the sophomore or junior years. Six weeks, beginning the day after Commencement.

6 units. (Credit given only when taken at the University Farm).

102. Principles of Dairying.

(ROADHOUSE)

The secretion of milk, nature and composition of milk and dairying products; principles and application of the Babcock tests; a survey of the dairy industry; state dairy laws and a study of California dairy conditions.

5 hrs., first half-year; 3 units. Lectures, F, 1; S, 8; laboratory, F, 2-5.

Bacteriology of Milk. (See Veterinary Science 117).

(HARING and HART)

Courses 99, 102, and Veterinary Science 117 are required of students whose major is dairy industry.

(Given at Davis)

104. Cheese Making.

(DENNING)

Instruction and practice in the manufacture of cheddar, California (granular) jack, cottage, Neufchatel and breakfast cheeses. Organization and construction of cheese factories.

6 hrs., second half-year; 3 units. M Th, 10; Tu, 1-5.

128. Butter Making.

(DENNING)

The principles and practice of factory butter making including care of cream, cream grading and ripening, pasteurization, starter making, churning, moisture and salt control, packing and storage of butter, creamery organization, construction and equipment.

5 hrs., second half-year; 3 units. M, 1; Tu, 9; F, 1-4.

130. City Milk Supply and Dairy Inspection.

(ROADHOUSE and MARQUARDT)

Conditions affecting quality of milk for direct consumption; requisites for producing different grades of milk; tests for quality, adulteration, etc.; pasteurizing, standardizing, cooling and bottling milk for distribution; preparation of culture milk and the inspection and scoring of dairies, milk plants, milk and cream.

5 hrs., second half-year; 3 units. W F, 10; Th, 1-4. Prerequisites: Course 102 and Veterinary Science 117.

131. Testing Dairy Products. (MARQUARDT)  
 Technical tests to determine composition of milk, cream, butter, cheese, ice cream, condensed and evaporated milk, casein and such other tests as are used in commercial manufacturing plants.  
 4 hrs., second half-year; 2 units. W, 1-5.
133. Seminar in Dairy Industry. (ROADHOUSE and DENNING)  
 Bi-weekly reports and papers with discussions of subjects assigned.  
 2 hrs., second half-year; 1 unit. Hours to be arranged.

### ENTOMOLOGY

1. General Entomology. (WOODWORTH and VAN DYKE)  
 A general review of the structure, habits, and classification of insects.  
 2 hrs., either half-year. Sec. I (Van Dyke), Tu Th, 10. Sec. II (Woodworth), Tu Th, 1. Course 3 or 4 must be taken concurrently with this course.
2. Economic Entomology. (FREEBORN)  
 Detailed studies of a series of the most injurious insects.  
 2 hrs., either half-year. Tu Th, 11. Course 3 or 4 must be taken concurrently with this course.
3. Supplementary Course. (The STAFF)  
 Designed to supplement the lecture courses 1 and 2 but may be taken separately and students may register in more than one section. No credit except when taken for three or more units or concurrently with another course.  
 1-3 hrs., either half-year; 1 unit for each section. Eight sections, hours to be arranged.
4. Elementary Systematic Entomology. (VAN DYKE)  
 The structure and classification of insects. Laboratory studies supplemented by field work.  
 6 hrs., laboratory and 3 hrs., field work; either half-year; 3 units. Tu Th, 1-4.
6. Parasites. (FREEBORN)  
 Classification, biology, relation to disease, principles of control as applied to the commoner parasites of man and beast. Lectures and recitations.  
 3 hrs., first half-year. Tu Th, 10; a section meeting to be arranged.
- \*27. Ecology. (FREEBORN)  
 Animal communities; the relation of animals to their environment, including such topics as hunger and food, behavior, growth, adaptation and variation, social habits, insects and plants, aquatic habits, etc. Lectures, assigned reading, and written report on a given animal community. Bi-weekly quiz.  
 3 hrs., second half-year. M W F, 10.

\* Not to be given, 1918-19.

99. Practice in Entomology.

(The STAFF)

In the summer of 1915 a study of forest insects in the High Sierra was engaged in under the direction of Mr. E. C. Van Dyke. In 1916 a mosquito-malaria survey of the State was undertaken in co-operation with the State Board of Health under the direction of Mr. W. B. Herms. In 1917 the work consisted of a survey of the Monterey National Forest for honey plants and apiary sites under the direction of Mr. G. A. Coleman. In 1918 and 1919 field work will be offered by the members of the staff.

6 weeks, beginning the day after Commencement; 6 units.

103. Special Problems.

Class or individual instruction. Students may register in more than one section.

6-12 hrs., either half-year; 2-4 units for each section. Laboratory hours to be arranged with instructor; Sections: I, Coleman (Homopterous insects and their parasites), II, Gray (Insecticide laws and decisions), III, Van Dyke, IV, Coleman (Apiculture), V, Woodworth (Microscope calculation and testing), VI, Severin (Microscopical technique), VII, Essig, VIII, Freeborn (Parasitology), IX, Freeborn.

105A-105B. Apiculture.

(COLEMAN)

Anatomy, embryology and physiology of the honey bee, with practice in the more common manipulations in the apiary; apiary practice, including queen breeding; control of bee diseases, etc.

7 hrs., throughout the year; 3 units each half-year. Lecture, Tu, 10; laboratory, Tu, 1-2. May be taken by lower division students in other departments by permission of instructor.

106A-106B. Insect Structure.

(SEVERIN)

First half-year.—External structure of insects with a detailed study of the mouth-parts.

Second half-year.—Internal anatomy and methods of insect histology. 6 hrs., throughout the year; 2 units each half-year. Tu Th, 1-4.

112. Advanced Systematic Entomology.

(VAN DYKE)

Advanced study of the classification of insects.

9 hrs., either half-year; 3 units. M W F, 1-4, or by arrangement. Prerequisite: course 4.

114. Forest Insects.

(VAN DYKE)

Insects in their relationship to forests and woodlands.

2 hrs. lecture, 3 hrs. field work, either half-year; 3 units. Tu Th, 4. Prerequisite: course 4.

\*116. Veterinary Parasitology.

(FREEBORN)

The relation of animal parasites and disease carriers to domesticated animals, with special emphasis placed on control. For students in veterinary science and animal industry. This course satisfies in full the requirements in parasitology in Class A veterinary colleges.

8 hrs., first half-year; 4 units. Lectures, M W, 10; laboratory, M W, 1-4. Prerequisite: Zoology 1A and Bacteriology 1, or equivalent.

\* Not to be given, 1918-19.

117. Insecticide and Fungicide Preparation. (MILLER)  
Laboratory practice in the preparation of the insecticides and fungicides which may be prepared on the farm. Given only in conjunction with course 118 or other allied course.  
3 hrs., first half-year; 1 unit. W, 2-5.
118. Insecticides and Fungicides. (GRAY)  
The chemistry and composition of remedies used for the control of parasites that infest vegetation and animals, including the source of raw materials, commercial, and home manufacturers. Lectures and recitations.  
3 hrs., first half-year. M W F, 8.
121. Life History Work. (VAN DYKE)  
Method and practice in working out the life histories of insects in insectary and field.  
6-9 hrs., either half-year; 2 or 3 units. Tu W Th, 1-4. Prerequisite: course 1, 2 or 4.
- \*122. Floral and Landscape Entomology. (ESSIG)  
The common insects which attack flowers and ornamental plants in California, their classification, life histories, and control. Lectures, illustrated by specimens and lantern slides, laboratory, and field work. For students in landscape gardening and floriculture, but open to all advanced students.  
8 hrs., second half-year; 4 units. Lectures, M W, 4; laboratory, M W, 1-4.
124. Orchard Insects. (DE ONG)  
The most important western insects attacking citrus, deciduous, nut and other orchard trees; classification, structure, life histories and control. Lectures illustrated with specimens and lantern slides.  
Laboratory exercises based on the examination of living and prepared specimens from the orchards will be illustrative of the lectures. Field trips will be required also. For students in citriculture and pomology, but open to all upper division students.  
8 hrs., first half-year; 4 units. Lectures, Tu Th, 4; laboratory, Tu Th, 1-4.
126. Medical Parasitology. (FREEBORN)  
The role of animal parasites in the transmission of human diseases; habits and control. For students in public health, hygiene, medicine, and sanitary science. Lectures and demonstrations.  
4 hrs., second half-year; 3 units. M Tu W Th, 3. Prerequisite: Zoology 1A and Bacteriology 1.

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\* Not to be given, 1918-19.

127. Medical Parasitology Laboratory. (FREEBORN)  
Laboratory exercises involving the study of animal parasites of the human. Open to students who have had or are taking course 126 or equivalent.  
6 hrs., second half-year; 2 units. M W, 1-4.
- 129A-129B. Undergraduate Thesis Course. (WOODWORTH, FREEBORN, VAN DYKE and GRAY)  
An investigation of a special problem in entomology or parasitology with a typewritten report on the results. Open only to seniors.  
6-15 hrs., throughout the year; 2-5 units. Hours to be arranged.
- 200A-200B. Seminar in Parasitology.  
Discussion of reports prepared by members of the class, based either upon investigations made by the students or upon special articles of importance. Required of all students in courses 129 and 201. The seminar may be repeated indefinitely without duplication of work.  
1 hr., throughout the year. Tu, 4.
- 201A-201B. Research in Parasitology. (FREEBORN)  
12 or more hrs., throughout the year; 4 or more units. Hours to be arranged.
- 202A-202B. Research in Systematic Entomology. (VAN DYKE and ESSIG)  
The revision of a group of insects.  
12 or more hrs., throughout the year; 4 or more units. Hours to be arranged.
- 205A-205B. Research in Insect Biology. (WOODWORTH and SEVERIN)  
Problems in the physiology of insects or the action of insecticides.  
12 or more hrs., throughout the year, to be arranged.
- 218A-218B. Research in Insecticides. (GRAY and MILLER)  
Investigation of special problems.  
12 or more hrs., throughout the year; 4 or more units. Hours to be arranged.

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### FARM MECHANICS

(Given at Davis)

2. Shop Practice: Carpentry. (BELTON)  
The care and use of wood-working tools. Laying off work, joining, framing and construction of models and sections of buildings. The practice work is supplemented by lectures and demonstrations.  
6 hrs., second half-year; 2 units. M Tu, 8-11.
3. Shop Practice: Blacksmithing. (INGRIM)  
Principles of forging and welding; making and tempering hand tools; sharpening and repair of farm implements.  
6 hrs., second half-year; 2 units. W Th, 8-11.

**101. Farm Machinery and Farm Motors.****(DAVIDSON)**

Economics of farm machinery, mechanics of machines, materials of construction. The development, construction, functions, adjustment, operation, and repair of farm machinery. The production and transmission of power. Principles of draft. The study of the horse as a motor; gasoline and oil engines; electric power; tractors. Laboratory work will consist of the study, operation, and adjustment of the machines discussed in the classroom.

8 hrs., second half-year; 4 units. Lectures: Sec. I, Tu Th, 8; Sec. II, Tu Th, 9. Laboratory: Sec. I, M F, 8-11; Sec. II, M, 1-5; Tu, 3-5; Sec. III, W, 9-11; F, 1-5.

**102. Dairy Mechanics.****(DAVIDSON and FLETCHER)**

Conducted in co-operation with Division of Dairy Industry. Lectures on the management and repair of steam boilers and gas engines, electric motors, pumps, refrigerating machinery, creamery machinery; construction of cold storage rooms. Practice work in soldering, babbiting, pipe fitting, erection of shafting, flue fitting and testing and the actual operation of a creamery power plant.

4 hrs., second half-year; 2 units. Hours to be arranged.

**FORESTRY****1. Elements of Forestry.****(MULFORD and METCALF)**

The relations of forestry to the everyday life of a nation. The influence of forests upon water supply, climate, soil, and public health; the products of the forest; the life story of the tree and the forest; general principles of forestry practice; protection of the forest from fire and other enemies; present organization of forestry work in the United States and Europe. Several lectures on fish and game protection will be given by Dr. H. C. Bryant, of the California Fish and Game Commission.

3 hrs., second half-year. M W F, 9, and one quiz section weekly.

**2. Forestry Methods.****(METCALF)**

Identification of common woods used by the carpenter and the cabinet maker; identification of the principal timber trees of the Pacific Coast; uses of various kinds of wood; tree seeds; forest nurseries; starting forests by direct seeding and by planting; measurement of the contents of felled and standing trees; methods of determining the value of standing timber. Lectures, laboratory, and field work.

5 hrs., first half-year; 3 units. Lectures, M W, 9; laboratory, Th, 1-4; another laboratory section will be arranged if necessary.

Either course 1 or 2 may be taken separately without prerequisite; the two courses should meet the needs of students who wish a general knowledge of forestry and its methods, but who do not wish the detailed professional courses listed below.



## 99. Practice in Forestry.

(The STAFF)

Practice in scaling and estimating timber and the study of its growth; timber survey of a large tract; detailed study of logging and milling operations; field instruction in silviculture; collection of data for a working plan.

Eleven weeks, summer camp; 6 units. To be held in the pine region of the Sierra or in the redwood region, near large logging operations.

## Woodsmanship.

While in camp for course 99, instruction in woodsmanship will be given. Students who make forestry their major subject will be required to become reasonably proficient in woodsmanship. No credit.

## 101. Forest Mensuration.

(The STAFF)

The measurement of saw logs and other manufactured products, of standing timber, and of the growth of trees and stands.

6 hrs., second half-year; 3 units. Lectures, M W, 11; laboratory and field work, Tu, 1-4.

## 104. Silviculture: Forest Ecology and Natural Reproduction. (MULFORD)

The influence of site on the forest and of the forest on the site; the behavior of trees as members of a forest community; forest description; the methods of reproducing the forest without planting or sowing; the care of the crop during its growth; timber sale marking.

7 hrs., second half-year; 5 units. Lectures, Tu Th F S, 8; field work, S, 9-12.

## 106. Silviculture: Artificial Reproduction.

(METCALF)

Tree seeds; direct seeding; the forest nursery; forest planting; woodland and windbreak planting; fixation of sand dunes.

4 hrs., first half-year; 2 units. Lecture, F, 10; laboratory or field work, Tu, 1-4.

## 108. Timber Trees and Forest Regions.

(METCALF)

Brief survey of the forest regions of the world; detailed account of the forest regions of the United States and Canada; the distribution, importance, and silvical characteristics of the leading timber trees of the United States and Canada, and the identification of such of these as do not grow in California. (The identification of California trees is given in Botany 104A.)

6 hrs., first half-year; 3 units. Lectures, Tu Th, 8; laboratory, S, 8-12.

## 110. Forest Protection.

(The STAFF)

The protection of forests from fire, insects, fungi, trespass, etc.

5 hrs., second half-year; 3 units. Lectures, Tu Th, 10; conference, W, 1-4.

## 112. Forest Utilization.

(SHATTUCK)

The manufacture, seasoning, grading, and care of rough and finished lumber; the principal industrial uses of lumber; minor wood-using industries; utilization of products other than wood, such as forage, fish, and game.

5 hrs., first half-year; 3 units. Lectures, Tu Th, 9; laboratory, F, 1-4.

## 114. Wood Technology.

(SHATTUCK)

Identification of economic woods; physical, chemical, and mechanical properties of wood; utilization of waste; technical forest products; wood preservation; paper pulp; destructive distillates.

5 hrs., first half-year; 3 units. Lectures, M W, 11; laboratory, W, 1-4.

## 115. Logging.

(The STAFF)

The manufacture and transportation of saw logs from stump to mill.

5 hrs., second half-year; 3 units. Lectures, M W, 9; laboratory, Th, 1-4.

## 118. Forest Improvements.

(THE STAFF)

The construction and maintenance of forest trails, roads, bridges, and telephone lines.

5 hrs., second half-year; 3 units. Lectures, Tu Th, 9; laboratory, F, 1-4.

## 120. Forest Finance and Organization.

(The STAFF)

Forest finance, including compound interest in forest calculations; appraisal of timber and forest soil; damages; taxation; timber bonds; timber insurance; regulation of timber cut; working plans.

7 hrs., second half-year; 5 units. Lectures, Tu Th F S, 8; conference, S, 9-12.

## 122. Forest Economics, Administration, and History.

(The STAFF)

Timber supply of the world and nation, its amount, location, use, replenishment, etc.; economic situation of the lumber industry; National Forest administration; the application of the principles of scientific management to forest administration; forest policy and its expression in important forest laws; historical development of forestry.

6 hrs., second half-year; 4 units. Lectures, M W F, 10; conference, M, 1-4.

## 128. Conference.

(SHATTUCK)

Round-table discussions of forestry problems; individual topics of study will be assigned.

3 hrs., either half-year, to be arranged. May be repeated without duplication of credit. Open only to students with a major in forestry.

**130A-130B. Grazing.**

(SHATTUCK)

History of the industry in the United States; its importance; methods of restoration of range; grazing reconnaissance; carrying capacity; water development; rotation and deferred grazing; study of range plants with reference to their relative value for grazing purposes; methods of administration and the application of grazing working plans; protection and development of timber, forage and game; handling live stock on the range.

5 hrs., throughout the year; 3 units each half-year. Lectures, M W, 8; laboratory or field work, M, 1-4. Either 130A or 130B may be taken independently.

**\*132A-132B. Advanced Grazing.**

(SHATTUCK)

Advanced study of special grazing problems.

5 hrs., throughout the year; 3 units each half-year. Prerequisite: course 130A-130B.

**202A-202B. Research.**

(MULFORD, SHATTUCK and METCALF)

Individual advanced study and research in silviculture, forest management, forest engineering, forest utilization, wood technology, forest protection, or forest policy.

3 to 6 hrs., throughout the year, to be arranged.

**COURSES IN OTHER DEPARTMENTS**

Industrial Hygiene. [See Hygiene 6.]

Agrostology. [See Agronomy 108.]

Forest Botany. [See Botany 104A.]

Forest Insects. [See Entomology 114.]

Surveying. [See Civil Engineering 1A-1B, 3, 102, 102c.]

Tree Surgery. [See Landscape Gardening 108.]

Strength of Materials. [See Civil Engineering 108ABC.]

Elements of Steam Engineering. [See Mechanics 1A.]

Elements of Electrical Engineering. [See Electrical Engineering 1B.]

Principles of Accounting. [See Economics 14A-14B.]

Factors of Industrial Efficiency. [See Economics 121.]

Cost Accounting. [See Economics 161.]

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**GENETICS****1. Principles of Breeding Plants and Animals. (BABCOCK and COLLINS)**

Study of variation and heredity with reference to plant and animal improvement.

6 hrs., second half-year; 4 units. Two lectures, one recitation and one laboratory period per week. Lectures, Tu Th, 8. Recitations, Sec. I, M, 8; II, W, 8. Laboratory, one section, Tu, 1-4. Prerequisite: Botany 2, 3 and Zoology 1A.

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\* Not to be given, 1918-19.

120. Special Topics and Pro-seminar. (BABCOCK and COLLINS)  
 Individual study of selected topics, the results to be embodied in a report or thesis. Laboratory or field work with reading. Weekly meetings with reports and discussions on topics in genetics.  
 7 to 13 hrs., either half-year; 3 to 5 units. Pro-seminar, and laboratory or field work to be arranged. Prerequisite: course 1. With instructors' permission may be repeated without duplication of credit.
200. Research. (BABCOCK and COLLINS)  
 Units and hours to be arranged.

### IRRIGATION PRACTICE

(Given at Davis)

120. Irrigation Practice. (BECKETT)  
 Practical field problems in the preparation of land, conveyance, measurement and application of water to various crops.  
 7 hrs., second half-year; 3 units. Lecture, W, 10; laboratory, Sec. I, M F, 8-11, II, Tu, 3-5; W, 1-5; III, Tu, 1-4; S, 9-12. Prerequisite: Irrigation 113, Civil Engineering 1A or 1E.
121. Special Problems in Irrigation Practice. (BECKETT)  
 The preparation of land and application of water to various crops; the rates of application, rate of flow of water over the land, and distribution of moisture in the soil following irrigation.  
 7 hrs., second half-year; 3 units. 1 hr. lecture, two 3-hr. periods field work, to be arranged. Open to students who are taking or who have taken course 120.

### LANDSCAPE GARDENING AND FLORICULTURE

1. Plant Propagation. (GREGG)  
 A study of the methods of securing and perpetuating desirable varieties of plants—seedage, division, layerage, cuttage, budding, and grafting. Lectures, reports, and practical exercises.  
 6 hrs., second half-year; 4 units. Lectures and recitations, M W F, 9; practice, five sections, I, F, 2-5; II, M, 2-5; III, W, 2-5; IV, Th, 2-5; V, Tu, 2-5.
- 99A. Practice in Landscape Gardening. (GREGG and STEVENS)  
 Summer course of six weeks arranged to give a general survey of the art of landscape gardening. Required of all students with a major in landscape gardening at the end of the junior year.  
 Beginning the day after Commencement; 6 units.

- 99B. Practice in Floriculture. (CAREY)  
Summer course of six weeks arranged to give a general survey of the field of commercial floriculture, or to meet the needs of individual students. Required of all students with a major in floriculture at the end of the junior year.  
Beginning the day after Commencement; 6 units.
101. The Ornamentation of Home Grounds. (GREGG and STEVENS)  
The principles of design as applied to home grounds, together with the correct use of the best plant materials for such areas. Lectures, assigned readings, and reports.  
2 hrs., second half-year. M W, 10.
103. The Theory and Aesthetics of Landscape Gardening. (GREGG)  
The different styles of landscape art and the principles governing correct design.  
6 hrs., first half-year; 4 units. Lectures, M W F, 9; drafting, W, 2-5. Required of all students with a major in landscape gardening; open to students in architecture and engineering.
- 104A-104B. Plant Materials. (STEVENS)  
The form, habit, texture, and adaptations of trees, shrubs, vines, and herbaceous plants with reference to their value and use in landscape design.  
6 hrs., throughout the year; 2 units each half-year. First half-year, Tu, 8-10; S, 8-12; second half-year, W, 9-11; S, 8-12. Prerequisite: Botany 2 and 3.
- 104c. Plant Materials. (STEVENS)  
Advanced study of plant adaptation.  
6 hrs., first half-year; 2 units. W, 9-12; Th, 8-11.
105. Elementary Landscape Gardening. (STEVENS)  
The simpler problems of design with special reference to small areas, their reconstruction and improvement, from paced, chain, and plane table surveys, together with reports, estimates, and sketches.  
10 hrs., second half-year; 4 units. Lecture, M, 1; drafting, M W F, 2-5. Prerequisite: courses 103 and 104A.
- 106A-106B. Advanced Landscape Gardening. (GREGG)  
The more advanced problems of design and reconstruction from topographic and transit surveys as offered by the larger areas of parks, playgrounds, and country estates, with detailed plans, reports, and estimates.  
12 hrs., throughout the year; 4 units each half-year. M, 9-12; Tu Th F, 2-5. Prerequisite: course 105.

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### 107. History and Literature.

(JONES)

The history and literature of landscape gardening with special reference to early influences as they govern modern design.

2 hrs., first half-year. Lectures, M F, 1. Required of all students with a major in landscape gardening; open to students in architecture and engineering.

### 108. Tree Surgery.

(CAREY)

The most approved methods of caring for ornamental trees; the technical details of planting, pruning, and spraying, bolting, chaining, and cavity work; shade tree legislation and the duties of shade tree commissions and tree wardens.

4 hrs., first half-year; 3 units. Lectures, W, 2; laboratory, F S, 8-11.

### 109. Home Floriculture.

(STEVENS)

The propagation and culture of the more common annuals, herbaceous perennials and bulbous plants grown in California gardens; the preparation of soils and the planting of flower beds; the use of fertilizers and the preparation and application of spraying materials. Lectures, assigned reading, garden and greenhouse work.

5 hrs., second half-year; 2 units. Lectures, Tu Th, 11; laboratory, Tu, 2-5.

### 102A-102B. Commercial Floriculture.

(CAREY)

The growing of the principal florists' crops on a commercial scale, both under glass and in the field. Lectures, reports, greenhouse, and field work.

6 hrs., throughout the year; 4 units each half-year. Lectures, M W F, 1; laboratory, Tu, 2-5. Prerequisite: course 1, Botany 2 and 3.

### 201. Modern Civic Art.

(GREGG)

Advanced problems in design with special reference to city parks, municipal park systems, recreation areas, civic centers and other civic features, as they form an intimate part of the city plan as a whole. Lectures, outside reading, and the preparation of plans, specifications, estimates and reports.

24 hrs., first half-year; 8 units. Hours for consultation and criticism to be arranged. Allied subjects in engineering and architecture and other departments of the University, as recommended by the instructor, should be elected to parallel this course.

### 202A-202B. City and Town Planning.

(GREGG)

Advanced problems in planning and designing. The economic and aesthetic problems involved in the systematic planning and development of American cities. The progress of all phases of city and town planning in this and European countries is made the basis of lectures and outside reading. Extensive, practice projects are outlined and plans and specifications prepared for the development of new cities and towns and the replanning of others for their best economic and aesthetic development.

24 hrs., throughout the year; 8 units each half-year. Hours to be arranged. Recommended allied subjects as offered by other departments of the University must parallel this course.

**NUTRITION**

2. Pure Food and Drug Laws and their Operation. (LEA)  
The history of food legislation; critical discussion of national, state, and municipal laws on food inspection and control; the use of preservatives; adulteration and misbranding of foods; human foods and those for cattle and poultry. Lectures and recitations.  
2 hrs., first half-year. M W, 8.
99. Practice in Nutrition. (JAFFA)  
Arrangement for practice course requirements for students whose major is nutrition may be made by consultation with the head of the division.
106. Feeds and Feeding. (JAFFA and ALBRO)  
The composition and use of cattle and poultry foods; compounding of rations; practical application of the principles of animal nutrition to the rational feeding of farm animals. Lectures, recitations, and laboratory work.  
3 hrs., first half-year; 3 units. Tu Th, 1; laboratory periods to be arranged. Prerequisite: inorganic chemistry.
109. Laboratory Course in Dairy Chemistry. (ALBRO)  
Qualitative chemical and microscopical methods for examination of milk, butter, other dairy products and commercial milk foods, for the detection of preservatives and adulterants. Lectures and laboratory exercises.  
7 hrs., first half-year; 3 units. Hours to be arranged. Prerequisite: Chemistry 5.  
10 hrs., first half-year; 4 units. By special arrangement.
114. Fundamentals of Nutrition. (MATTILL)  
Designed to give the general students some knowledge of the nature and functions of food, and the mechanism involved in its digestion and utilization.  
2 hrs., first half-year. Tu Th, 2. Prerequisite: inorganic chemistry.
116. Foods and Food Products. (JAFFA)  
A detailed study of food materials, their physiological values and economic importance. Discussion of standards and dietaries.  
2 hrs., second half-year. Tu Th, 2. Prerequisite: inorganic chemistry; organic chemistry recommended.
117. Laboratory Course in Food Analysis. (MATTILL, ALBRO)  
Quantitative chemical and microscopical methods for examination and analysis of foods, and methods for detection of adulteration. Nature of the materials studied will depend upon the interest and preference of the student. Opportunities for advanced work may be offered.  
7 or 10 hrs., either half-year; 3 or 4 units. Hours to be arranged. Prerequisite: Chemistry 5.

119. Advanced Course in Food Chemistry. (LEA and ALBRO)  
A critical study of methods for determining the purity and quality of food products with special reference to the requirements of food and drug laws.  
7 hrs., second half-year; 3 units. Lecture to be arranged; laboratory, M W, 1-4.  
9 hrs. laboratory; 1 hr. lecture; 4 units; by special arrangement.  
Prerequisite: course 117 or Agricultural Chemistry 101A-101B.
120. Pro-seminar in Nutrition. (JAFFA)  
A critical study of the methods of feeding large groups and a discussion of the problems involved in the management of the commissary departments of institutions, industrial and agricultural organizations, camps, etc.  
2 hrs., second half-year, to be arranged.
- \*126. Advanced Nutrition. (MATILL)  
The chemistry and physiology of alimentation and a detailed study of the processes of metabolism involved in the nutrition and growth of animals.  
3 hrs., first half-year, to be arranged. Prerequisite: Chemistry 1A-1B, 8A-8B; Physiology, and Agricultural Chemistry 101A-101B recommended.
- \*127. Laboratory Course in Advanced Nutrition. (MATILL)  
A study of digestion and metabolism, with practice in nutrition experiments on animals and man. Designed to accompany course 126.  
6 hrs., first half-year; 2 units. Hours to be arranged. Prerequisite: Chemistry 1A-1B, 5, 8; Physiology, and Agricultural Chemistry 101A-101B recommended.
129. Problems in Nutrition and Food Chemistry. (JAFFA, MATILL, ALBRO)  
Hours and credit to be arranged. Thesis work may be included.
230. Seminar in Foods and Nutrition. (JAFFA)  
Discussion of recent work in food chemistry and feeding experiments with the interpretation of laboratory results. Nutrition aspects of the processes of manufacturing and preserving foods.  
2 hrs., first half-year, to be arranged.
231. Research in Food Chemistry and in Nutrition. (JAFFA)  
Hours and credit to be arranged.
- \*232. Seminar in Nutrition and Metabolism. (MATILL)  
Discussion of original papers in recent journals as a stimulus to further investigation.  
2 hrs., bi-weekly, second half-year; 1 unit.

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\* Not to be given, 1918-19.



### OLERICULTURE

(Given at Davis)

101. Vegetable Gardening. (ROGERS)  
 General principles of vegetable gardening; detailed directions for the production and marketing of vegetables under California conditions, supplemented by practical work in the garden.  
 8 hrs., second half-year; 4 units. Lectures, Tu, 11; W, 10; 6 hrs. practicums to be arranged.
201. Advanced Work in Vegetable Gardening. (ROGERS)  
 Hours and credit to be arranged.

### PLANT PATHOLOGY

99. Practice Course. (SMITH and HORNE)  
 Students with a major in plant pathology should register for this course not later than the middle of the junior year or after completing course 120. The course may be given either during the college year or in vacation, according to the material available and the circumstances of the individual student. The work will consist mainly in trips to various parts of California where the student may make field studies upon the nature, economic importance and practical control of representative plant diseases. 6 units. Not required of students with a major in plant pathology who have completed Agronomy 99, Citriculture 99, Pomology 99 or Soil Technology 99.
120. The Diseases Affecting Cultivated Plants in California. (HORNE, E. H. SMITH)  
 Lectures and laboratory studies on diseases of economic plants. A beginning course required of juniors whose major is plant pathology but intended also for other students who desire a general knowledge of the subject.  
 8 hrs., first half-year; 4 units. Lectures, Tu Th, 8; laboratory, section I, Tu Th, 9-12; II, Tu Th, 1-4. Prerequisite: junior standing in the College of Agriculture or a reasonable equivalent.
121. Special Undergraduate Study. (HORNE)  
 Laboratory work in continuation of course 120.  
 Second half-year; hours and credit to be arranged in each case. Prerequisite: course 120.
- 122A-122B. Advanced Course. (SMITH, HORNE, E. H. SMITH)  
 The principles of plant pathology, nature of disease, and the chief disease-inciting influences; disease-producing organisms, their development, activities and relation to host plants by means of microscopic, cultural, histological, and infection methods. Systematic review of important diseases. Lectures, laboratory, and collateral reading. Required of seniors whose major is plant pathology.  
 8 hrs., throughout the year; 4 units each half-year. Lectures, M W, 8; laboratory, M W, 9-12. Prerequisite: course 120 and Botany 105A.

## 125A-125B. Special Topics.

(SMITH, HORNE, E. H. SMITH)

Laboratory or field study of an assigned topic, with preparation of a thesis.

2 units, either half-year.

## 126A-126B. Pro-seminar.

(SMITH, HORNE, E. H. SMITH)

Papers and discussions by members of the class on various topics of interest in connection with the various courses. Required of all students whose major is plant pathology; open to other students enrolled in 121, 122, or 230.

1 hr., throughout the year. W, 4.

## 230. Graduate Research.

(SMITH, HORNE, E. H. SMITH)

Original investigations of special problems.

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**POMOLOGY**

## 99. Practice in Pomology.

(TAYLOR and SWEET)

A summer course intended to familiarize the student with orchard practice and fruit-handling as carried on in some of the principal fruit districts of the state. Details will be arranged to suit the needs and requirements, as far as possible, of individual students. 6 units. Required of all students with a major in pomology at the close of the junior year. Arrangements for registration must be made with the Head of the Division before April 15.

## 101. General Principles of Fruit Growing.

(SWEET)

Lectures and recitations.

3 hrs., first half-year. M W F, 9. Required of all juniors with a major in pomology. Open to juniors with a major in citriculture and viticulture and to a limited number of others by special permission.

## 102. Orchard Fruits.

(OVERHOLSER)

Deciduous tree fruits and nuts; their classification, propagation, planting, management. Care of orchards, adaptability of tree fruits to California and Pacific coast conditions. Attention will also be given to small fruits. Lectures and recitations.

3 hrs., first half-year. M W F, 10. Required of seniors with a major in pomology. Prerequisite: course 101.

## 103. Orchard Practice.

(OVERHOLSER)

A laboratory course designed to give the student actual practice under orchard and field conditions in the various operations of deciduous fruit production, propagation, planting, pruning, spraying, etc. Given at Davis.

9 hrs., second half-year; 3 units. W F, 1-5:30. Required of all juniors with a major in pomology. Prerequisite: course 101.

104. Fruit Transportation, Storage and Marketing. (SWEET)  
General principles underlying the harvesting, grading, packing, shipping, pre-cooling, storing, and marketing of fruits. The practices involved in the handling and movement of fruits crops, and their utilization. Lectures and recitations.  
3 hrs., second half-year. M W F, 10. Prerequisite: course 101 or 120, or Citriculture 101 or 102, or Viticulture 116.
- 105A-105B. Pro-seminar. (TAYLOR and SWEET)  
A study of pomological literature, experiment station and government publications bearing on pomological topics; the principles and methods of outlining and conducting experimental work; library references. Discussions and reports.  
2 hrs., throughout the year; 2 units each half-year. M, 3-5. Required of seniors and graduate students whose major is pomology. Not open to students in other divisions.
106. Systematic Pomology. (OVERHOLSER)  
A technical study of fruit varieties, their botanical and varietal relationships; description, identification scoring and judging. Laboratory work with informal lectures and recitations.  
6 hrs., first half-year; 2 units. Th F, 1-4. Required of all seniors with a major in pomology. Prerequisite: course 101.
107. Nuciculture. (TAYLOR)  
Nut fruits, including the almond, walnut, pecan, chestnut, filbert and others. Classification, propagation, location and management of orchards, harvesting, marketing and utilization. Lectures and recitations.  
3 hrs., second half-year. Tu Th S, 10. Prerequisite: course 101 or 120, or Citriculture 101 or 102, or Viticulture 116.
120. General Pomology. (TAYLOR and SWEET)  
The principles underlying the production of the various fruits, their handling and marketing. For students who have not the time for the more technical courses. Not open to students whose major is pomology. Lectures, recitations, and laboratory work.  
6 hrs., first half-year; 4 units. Lectures and recitations, M W F, 10; laboratory, section I, W, 2-5; II, S, 9-12. Prerequisite: Botany 2 and 3. Open to sophomores by special permission.
- Fruit and Vegetable Products. (See Viticulture 112, 115). (CRUESS)
201. Research. (TAYLOR)  
Open to graduate students who desire to write theses. Field or laboratory research with correlated reading.  
Hours and credit to be arranged. Prerequisite: courses 101, 102, 103, and 104, or equivalent.

### POULTRY HUSBANDRY

(Given at Davis)

99. Practice in Poultry Husbandry. (DOUGHERTY and LLOYD)  
Practice in feeding and caring for pens of fowls, grinding and mixing feeds, caring for young chicks, running incubators, and all of the work necessary in the management of a poultry plant. Required of all students whose major is poultry husbandry. 6 units.
101. Poultry Husbandry. (DOUGHERTY and LLOYD)  
The feeding, housing, breeding, and general management of poultry; study of the egg; anatomy and physiology of poultry; parasites and sanitation.  
5 hrs., second half-year; 3 units. Lectures, Th F, 11; laboratory, F, 2-5.
102. Poultry Management. (DOUGHERTY and LLOYD)  
A practice course in operating incubators, keeping records, hatching eggs, brooding chicks, feeding and caring for pens of fowls.  
Second half-year; 3 units. Practice, M Tu W Th F S Sun, 8-9, 11-12, 4-5. Course 101 must precede or accompany this course.
104. Pro-seminar. (DOUGHERTY and LLOYD)  
Advanced study and discussion, including a review of literature.  
4 hrs., second half-year; 2 units. Hours to be arranged. Prerequisite: courses 101 and 102.
105. Undergraduate Research. (DOUGHERTY and LLOYD)  
Original investigation of a problem in poultry husbandry, the results to be presented in a thesis.  
Second half-year; 1 to 3 units. Prerequisite: courses 101 and 102; must be preceded or accompanied by course 104.

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### RURAL INSTITUTIONS

201. Co-operation in Marketing. (MEAD)  
Study of farmers' co-operative organizations, especially those organized for the purchase of farm supplies and selling of farm products; legislation of different countries designed to improve marketing facilities. Assigned readings and reports.  
2 hrs., second half-year. Tu Th, 10.
202. Rural Credits and Land Settlement. (MEAD)  
A study of the rural credit and land settlement policies of other countries and of the methods and policies needed to promote rural development in the United States. Assigned readings and reports.  
2 hrs., first half-year. Tu Th, 10.
203. Research in Rural Institutions. (MEAD).  
Open to properly qualified graduate students who desire to write a thesis or prepare for publication a paper on some question connected with land settlement, co-operation, or marketing.  
Second half-year; hrs. and credit to be arranged. Prerequisites: courses 201, 202.

**SOILS AND FERTILIZERS**

2. Soil Conditions and Plant Growth. (LIPMAN)  
Fundamental principles involved in the relationships between soils and plant growth, including phases of soil chemistry, soil physics and soil bacteriology, and their relations to soil fertility.  
3 hrs., first half-year. Tu Th S, 11. Prerequisite: Chemistry 1A-1B, Physics 1A-1B. Not open to students enrolled in the College of Agriculture.
122. Soil Chemistry as Related to Soil Fertility. (LIPMAN)  
The chemical examination of soils, including short methods for some important determinations, and complete analyses. Laboratory and greenhouse exercises, recitations, and lectures.  
9 hrs., first half-year; 3 units. M W F, 1-4. Prerequisite: Chemistry 1A-1B, 5, and Soil Technology 1.
123. Soil Bacteriology as Related to Soil Fertility. (LIPMAN, WAYNICK)  
Laboratory experiments illustrating the relation of soil bacteria to soil fertility. Methods for the bacteriological examination of soils; greenhouse and field experiments. Recitations and lectures.  
9 hrs., second half-year; 3 units. M W F, 1-4. Prerequisite: course 122, Bacteriology 1.
- 126A-126B. Pro-seminar in Soils and Soil Fertility. (LIPMAN)  
Discussion of papers read, before the class, on various topics of research in soils by the several members of the seminar.  
1-2 hrs., throughout the year. F, 4-6. Required of all students in courses 122, 123, 127.
127. Special Problems. (LIPMAN)  
Undergraduate research in soils for senior theses or publications.  
Hrs. to be arranged. Prerequisites on consultation with the instructor.
235. Research in Soils and Soil Fertility. (LIPMAN, SHARP)  
Open to properly qualified graduate students who desire to write theses or prepare for publication papers on some phase of the science of soils.  
Hours to be arranged. Prerequisite: all the courses in soils above outlined or equivalent training.
236. Seminar in Soils and Soil Fertility. (SHARP)  
Critical discussions of advanced research on topics of importance to the specialist in soils.  
1-2 hrs., to be arranged. Prerequisite: graduate standing in soils and soil fertility.

### SOIL TECHNOLOGY

1. Soil Technology. (SHAW and A. SMITH)  
The origin, formation, classification, properties, and management of soils.  
6 hrs., second half-year; 4 units. Lectures, M W F, 1; laboratory, Sec. I, M, 2-5; II, F, 2-5. Prerequisite: Geology 1A and Agricultural Chemistry 1 and 2.
99. Practice in Soil Surveying. (SHAW and A. SMITH)  
A six weeks' study of the methods of classifying and mapping soils, consisting of practical field work in soil surveying; the construction of base maps; and the preparation of reports on the surveyed areas. Alkali soils and their reclamation, the adaptation of crops to soils, problems of irrigation, drainage, and soil management. The field work will be supplemented by an inspection trip, covering a large part of the state.  
6 units. Prerequisite: course 1.
101. Soils of the United States. (SHAW)  
A study of the soil types, series, and provinces of the United States; the origin, formation, classification, properties, and management of soils with reference to crop production in various regions.  
3 hrs., second half-year. M W F, 10. Prerequisite: course 1.
102. Advanced Soil Physics. (SHAW and A. SMITH)  
Physical composition of soils, soil structure, moisture relations and modifications. Laboratory and field work.  
7 hrs., second half-year; 3 units. Tu Th, 1-4 and 1 hr. of conference to be arranged. Prerequisite: course 1. May be repeated without duplication of credit.
103. Soils of California (SHAW)  
The classification, origin, formation, general character and present utilization of the soils of California, including a study of each of the important soil series occurring in the state.  
2 hrs., second half-year. M W, 9. Prerequisite: junior standing in College of Agriculture; open to other students by permission.

### VETERINARY SCIENCE

Courses in veterinary science may be counted either as major subjects in animal husbandry and dairy industry or as correlated courses, subject to the approval of the head of the divisions of animal husbandry and dairy industry.

100. Diseases of Farm Animals. (HARING and HART)  
The more common diseases of domesticated animals. For students in Berkeley who are unable to take advanced work in veterinary science at the University Farm.  
5 hrs., second half-year; 3 units. Lectures, M W, 3; laboratory or clinic, F, 2-5.

111. **Veterinary Science.** (HAYES)  
 The anatomy, physiology, and pathology of domesticated animals; the more common diseases of horses, cattle, sheep, and swine. (Given at Davis.)  
 8 hrs., second half-year; 4 units. Lectures, W, 8; Th, 9; laboratory, Th, 3-5; F, 1-5.
117. **Bacteriology of Milk, Sanitary Milk Production and Dairy Inspection.** (HARING and HART)  
 The production and distribution of the various grades of milk from a sanitary standpoint. Students will be required to participate in the work of the University Dairy. The time will be about equally divided between bacteriological work in the laboratory and field work at the various dairies.  
 5 hrs., first half-year; 3 units. Lectures, Tu Th, 1; laboratory or clinic, Th, 2-5. Prerequisite: elementary bacteriology.
119. **Thesis Course. Advanced Dairy Bacteriology.** (HARING, HART and HAYES)  
 Original study in special topics. (Given at Berkeley and also at Davis.)  
 Hours and credit to be arranged. Prerequisite: Bacteriology 1 and course 117.
200. **Research in Dairy Bacteriology, Dairy Sanitation and Animal Hygiene.** (HARING, HART and HAYES)  
 Laboratory and field research on special topics. (Given at Berkeley and also at Davis.)  
 Hours and credit to be arranged.
- Veterinary Parasitology.** (FREEBORN)  
 (See Entomology 116.)

## VITICULTURE AND ENOLOGY

99. **Practice in Viticulture and Enology.**  
 Students whose major is in this division may satisfy the requirements of this course by six weeks special work in the zymological laboratory during the sophomore or junior years or by taking Course 99 in one of the following divisions: agronomy, pomology, citriculture, or soil technology. The particular subject chosen must be selected by the student in consultation with the instructor in charge of his major subject.
116. **Viticulture.** (BIOLETTI)  
 Methods of establishing and maintaining vineyards, with special reference to conditions in California.  
 3 hrs., second half-year. M W F, 9.

**117. Ampelography and Viticultural Laboratory.**

Study of the structure, physiology and diseases of the vine.

9 hrs., second half-year; 3 units. M W F, 1-4. Course 116 must accompany or precede this course.

**112. Fruit and Vegetable Products.**

(CRUESS)

Lectures on the preparation, fermentation, and preservation of fruit and vegetable products. Canning, fruit juices, oil, acids, jellies, vinegar, denatured alcohol and other by-products are given particular attention. Course 115 should be taken concurrently.

3 hrs., second half-year. M W F, 8.

**114. Vinification.**

(BIOLETTI)

Lectures on the principles and methods of wine-making.

3 hrs., first half-year. M W F, 9.

**115. Fruit and Vegetable Products.**

(CRUESS)

Laboratory exercises covering subjects included in course 112.

9 hrs., second half-year; 3 units. M W F, 1-4. Course 112 must accompany or precede this course. Prerequisite: Bacteriology 1.

**122. Enological Laboratory I.**

(ZION)

Physical and chemical examination of grapes, and laboratory study of the processes of wine-making, wine handling and the microscopical examination of wine.

10 hrs., first half-year; 4 units. Lecture, F, 4; laboratory, M W F, 1-4. Course 114 must accompany or precede this course.

**199. Undergraduate Theses and Pro-seminar.** (BIOLETTI and CRUESS)

For undergraduate students in the preparation of senior theses and as an introduction to research work. Each student will pursue a special investigation and report the results in a paper. Subject and time to be chosen by the student with the advice and approval of the instructor.

The following courses are designed for students who have finished the corresponding undergraduate courses and who desire to study special problems. The hours and units are to be arranged with the instructors concerned.

**233. Research in Viticulture.**

(BIOLETTI)

**236. Research in Enology.**

(BIOLETTI)

**237. Research in Zymology.**

(BIOLETTI and CRUESS)



## ANATOMY

HERBERT McLEAN EVANS, B.S., M.D., Professor of Anatomy.

\*ROBERT O. MOODY, B.S., M.D., Associate Professor of Anatomy.

GEORGE W. CORNER, A.B., M.D., Assistant Professor of Anatomy.

PHILIP E. SMITH, Ph.D., Assistant Professor of Anatomy.

KATHERINE J. SCOTT, A.B., M.D., Instructor in Anatomy.

\*BENJAMIN H. PRATT, M.S., Assistant in Anatomy.

†FRANCIS A. TORREY, A.B., Assistant in Anatomy.

The department is equipped for investigation in the fields of systematic anatomy, neurology, histology, and embryology. The equipment includes a library of the chief anatomical periodicals and monographic literature and special facilities for experimental work.

*Microscopic Anatomy*

## 101. Histology and Microscopic Organology. (EVANS, SCOTT, PRATT)

The course will be given from the viewpoint of the activities of the living cell, the relation between structure and function being held uppermost. At the same time opportunity will be afforded for a comprehensive review of human and comparative histology. Individual loan collections will supplement the laboratory work.

First half-year. 3 laboratory periods, 3 lectures a week; 6 units. M W, 8-12; F, 8-11; S, 11-12. Prerequisite: chemistry, physics and elementary biology (zoology, botany, or physiology.)

## 103. Organs of Special Sense and Neurology. (SMITH, SCOTT)

The macroscopic and microscopic architecture of the central nervous system and the organs of special sense. The neuron studied in course 101 will be used as the unit in the construction of the nervous system, with a view to tracing origin, development, and final arrangement of the different pathways for nerve impulses.

5 hrs., second half-year; 3 units. Lectures, F, 8, 1; laboratory, F, 2-5.

*Systematic Human Anatomy*

## †102. General Human Anatomy. (MOODY)

A study of the human body. Demonstrations and laboratory study of prepared human dissections, models, and microscopic slides. For students of public health and physical education. Other non-medical students may be admitted by arrangement with instructor, if size of class permits. A deposit of \$2.50 will be required to cover cost of material; any unused portion of this sum will be returned.

5 hrs., second half-year; 3 units. Demonstration, Tu Th, 9; laboratory W, 1-4. Prerequisite: Zoology 1A or Physiology 1.

\* Absent on leave, 1918-19; † in residence first half-year only; ‡ second half-year only.

† Not to be given, 1918-19.

105. **Systematic Human Anatomy.** (CORNER, SMITH, TORREY)  
Systematic dissection and study of the human body, with conferences upon the principles of its development, structure, and function.  
27 hrs., first half-year; 10 units. Tu Th, 8-12; S, 8-11; M Tu W Th F, 1-5.
108. **Regional and Topographical Anatomy.** (CORNER)  
Each student will be assigned a problem involving the preparation of cross-sections, special dissection of formol-hardened material, the mapping of topographical relations, etc. In class-room conferences the structure of the body will be reviewed in its relation to physiological activity. Students who are accepted for course 213 may substitute that for course for 108.  
4 hrs., first half-year; 3 units. Recitations, Tu, 8-10; laboratory: Sec. I, W, 1-4; Sec. II, F, 8-11.
109. **Anatomy for Physicians and Advanced Students.** (EVANS, MOODY, CORNER)  
Hours to be arranged.
209. **Human Embryology.** (EVANS)  
A laboratory study of specific problems in the development of the human embryo. Access will be given to a considerable private collection and its related data. Open only to students familiar with vertebrate embryology.  
Hours to be arranged.
210. **History of Anatomy.** (CORNER)  
Informal conferences upon the history and literature of anatomy and its relation to the progress of general medical knowledge, illustrated by old books and figures. Class limited to six students.  
1 hr., second half-year, to be arranged.
- \*211. **Physiological Anatomy of Reproduction.** (CORNER)  
Informal conferences and demonstrations. The oestrous cycle, implantation, comparative placentation, etc. Outside reading required.  
1 hr., first half-year, to be arranged.
212. **Experimental Embryology.** (SMITH)  
Conferences and original work by the experimental method, chiefly with amphibian material on problems of developmental mechanics.  
Second half-year. Hours to be arranged.

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\* Not to be given, 1918-19. The course will be given alternately with course 210.

**213. Original Investigation. (EVANS and Members of the Staff)**

Students and others who are prepared to undertake research in any of the anatomical sciences will be given facilities and encouragement by members of the staff. Time devoted by the majority of the second-year medical class to course 108 may be applied here by those specially qualified.

Hours to be arranged.

**214. Seminar. (EVANS)**

Topics will be discussed by the staff and those electing the course. For the year 1918-19, topics will be chosen from the field of human and comparative embryology.

Hours to be arranged.

**ANTHROPOLOGY**

A. L. KROEBER, Ph.D., Associate Professor of Anthropology and Curator of the Anthropological Museum.

PAUL RADIN, Ph.D., Instructor in Anthropology.

EDWARD W. GIFFORD, Associate Curator of the Anthropological Museum.

THEODORE GRAY, A.B., LL.B., Teaching Fellow in Anthropology.

MONICA FLANNERY, M.A., Teaching Fellow in Anthropology.

Students who expect to take only one course in anthropology during their college career are advised to elect course 1A-1B.

*Honor-students in the upper division.*—Course 1A-1B is prerequisite to honor-work in the upper division. The requirement of 24 units in major courses must normally include courses 103A, 103B, 105A, 105B, and 199A-199B.

**LOWER DIVISION COURSES**

- 1A. General Anthropology: Origin and Antiquity of Man. (The STAFF)  
 Man as an animal; heredity; races and their distribution; earliest culture.  
 3 hrs., first half-year. M W F, 9, and section meetings.
- 1B. General Anthropology: Origin and Development of Civilization.  
 (The STAFF)  
 The source and growth of institutions, arts, customs, industries, language, and religion.  
 3 hrs., second half-year. M W F, 9, and section meetings.

**UPPER DIVISION MAJOR COURSES**

- 103A. Ethnography. (RADIN)  
 The native tribes and nations of Oceania and Africa. Lectures and conferences.  
 3 hrs., first half-year. M W F, 4.
- 103B. Ethnography. (RADIN)  
 The peoples and cultures of Europe, Asia, and America.  
 3 hrs., second half-year. M W F, 4.
104. Prehistoric Archaeology. (RADIN)  
 The rudiments of civilization in the stone ages: implements, geological antiquity, associated animals; the bronze age; lake dwellings, growth of culture; the iron age and transition to historic period; prehistoric trading and trade routes.  
 3 hrs., first half-year. M W F, 2.

- 105A. Ethnology of North America. (GIFFORD)  
The native peoples and indigenous civilizations of America north of Mexico.  
3 hrs., first half-year. M W F, 9.
- 105B. Ethnology of Mexico and Central America. (RADIN)  
The native peoples of Mexico and Central America, past and present, and the more important archaeological sites. Lectures, recitations, and the preparation of a paper.  
3 hrs., second half-year. M W F, 2.
115. Peoples of the Philippines. (KROEBER)  
Black and brown races; pagan peoples; Hindu, Mohammedan, and Christian influences; East Indian relations; present status.  
3 hrs., first half-year. M W F, 10.
132. Anthropology of the Bible. (KROEBER) •  
The Old Testament as an historical document in the light of archaeology and anthropology.  
3 hrs., second half-year, M W F, 10.
137. Indians of California. (GIFFORD)  
Origin and relationships of the natives; prehistoric remains; shell mounds. Tribal divisions; arts; customs; industries; beliefs.  
3 hrs., second half-year. M W F, 9.
- 199A-199B. Honor-course. (The STAFF)  
Special problems by individual students, with credit of not less than 3 units.  
3 hrs., throughout the year. M W, 11, and other hrs. to be arranged.

#### GRADUATE COURSES

- 206A-206B. Anthropological Seminar. (The STAFF)  
First half-year, religion; second half-year, social organization.  
3 hrs., throughout the year. M, 7-9 p.m.
- 207A-207B. Special Work in Anthropology. (The STAFF)  
Research work on special problems by individual students according to their qualifications and needs, with credit proportionate to the work done.  
At least 2 hrs., throughout the year. M W, 11.

## ARCHITECTURE

- JOHN G. HOWARD, Fellow in the American Institute of Architects, Professor of Architecture and Director of the School of Architecture.  
 WILLIAM C. HAYS, B.S., Associate Professor of Architecture.  
 WILLIAM E. LELAND, B.S., Lecturer in Architectural Mechanics.  
 WARREN C. PERRY, B.S., Assistant Professor of Architecture.  
 M. EARL CUMMINGS, Instructor in Modeling.  
 † VALERE DE MARI, Instructor in Water-coloring and Pen and Ink Drawing.  
 RAYMOND W. JEANS, B.S., Instructor in Water-Coloring and Pen and Ink Drawing.

\* *Honor-students in the Upper Division.*—The student must have received honorable mention with the junior certificate, or, in case of seniors, have completed the junior work in architectural design with distinction.

1. Candidates for honors must be registered in the architectural curriculum as laid down in the Circular of Information.
2. At the beginning of each half-year each candidate will be required to submit his study-list to the head of the department for approval, and thereafter work in close touch with the various instructors, attending such conferences and making such reports as may be asked for.
3. Under the "value" system, as defined in the Circular of Information, honor-students will be encouraged to proceed to the more advanced work in design as they show fitness for it.
4. Honors in architecture require distinguished excellence in design and thoroughly satisfactory work in construction.

## LOWER DIVISION COURSES

†5A-5B. History of Ancient and Classic Architecture. (PERRY)

A general survey of the history of ancient and classic architecture, with an analytical study of its character, illustrated by lantern slides. Open to all students specially interested in architecture and as a free elective to upper division students.

1 hr., throughout the year; 1 unit each half-year. Tu, 2.

† Absent on leave, 1918-19; \* for the duration of the war.

† The full course in History of Architecture and Allied Arts (5A-5B, 5C-5D, 5E-5F) is covered in three years, the courses being given in succession, one each year.

\*†5C-5D. History of Medieval and Renaissance Architecture. (HOWARD)  
The architecture of the Middle Ages and the Renaissance period illustrated by lantern slides. Open to all students specially interested in architecture and as a free elective to upper division 1 hr., throughout the year; 1 unit each half-year. Tu, 2.

\*† 5E-5F. History of Modern Architecture and Allied Arts. (HOWARD)  
A detailed study of modern architecture and allied arts, illustrated with lantern slides. Open to all students specially interested in architecture and as a free elective to upper division students. 1 hr., throughout the year; 1 unit each half-year. Tu, 2.

11. The Classic Orders of Architecture. (PERRY)  
9 hrs., second half-year; 3 units. Prerequisite: Drawing 3A, 3B, 3C.

12A-12B. Water Color. (JEANS)  
Architectural rendering in water color.  
3 hrs., throughout the year; 1 unit each half-year; elementary, M, 1-4; advanced, Th, 8-11. Prerequisite: Graphic Art 14A-14B.

13A-13B. Pen and Ink. (JEANS)  
Architectural subjects rendered in pen and ink.  
3 hrs., throughout the year; 1 unit each half-year; elementary, F, 1-4; advanced, Th, 1-4. Prerequisite: Graphic Art 14A-14B.

14A-14B. Modeling. (CUMMINGS)  
Modeling of architectural ornament.  
3 hrs., throughout the year; 1 unit each half-year. Two sections: I, Tu, 8-11; II, F, 8-11.

NOTE.—Courses 12A-12B, 13A-13B, 14A-14B may be continued and additional credit received.

## UPPER DIVISION MAJOR COURSES

101A-101B. Elements of Architectures. (PERRY)  
Elementary architectural design. Course 106A-106B must be taken concurrently.  
9 hrs., throughout the year; 3 units each half-year. Prerequisite: course 11, and junior standing.

102A-102B. Planning. (HAYS)  
Fundamental problems in planning. Course 106C-106D must be taken concurrently.  
12 hrs., first half-year, 4 units; 15 hrs., second half-year, 5 units. Prerequisite: course 101A-101B.

\* Courses 5C-5D, 5E-5F will not be given in 1918-19.

† The full course in History of Architecture and Allied Arts (5A-5B, 5C-5D, 5E-5F) is covered in three years, the courses being given in succession, one each year.

## 105A-105B. Historical Drawings in Ancient and Classic Architecture.

(HOWARD and PERRY)

3 hrs., throughout the year; 1 unit each half-year. Course 101 or 102 must accompany this course.

## \*105C-105D. Historical Drawings in Conjunction with Course 5C-5D.

(HOWARD and PERRY)

3 hrs., throughout the year; 1 unit each half year. Course 101 or 102 must accompany this course.

## \*105E-105F. Historical Drawings in Conjunction with Course 5E-5F.

(HOWARD and PERRY)

3 hrs., throughout the year; 1 unit each half-year. Course 101 or 102 must accompany this course.

## 106A-106B. Theory of Architecture.

(PERRY)

Pro-seminar, prescribed for students in course 101A-101B.

1 hr., throughout the year; 1 unit each half-year. W, 3.

## 106C-106D. Theory of Architecture.

(HAYS)

Continuation of course 106A-106B. Pro-seminar, prescribed for students in course 102A-102B.

1 hr., throughout the year; 1 unit each half-year. Th, 5.

## 108A-108B. Architectural Mechanics.

(LELAND)

Mechanical, electrical and plumbing installation and equipment in relation to architecture. (a) Heating, ventilating and power; (b) plumbing, lighting, elevators, vacuum cleaning, automatic sprinklers, etc.

2 hrs., throughout the year; 2 units each half-year. M W, 8.

## 110. Housing.

(HAYS)

Lectures on the house—isolated and collective: its historic and aesthetic development; its elements and their arrangements; its equipment.

1 hr., second half-year. Th, 2.

## GRADUATE COURSES

## 203A-203B. Planning and Composition.

(HOWARD)

Problems in planning and composition.

24 hrs., throughout the year; 8 units each half-year. Conference hours, Tu Th, 3-4:30. Prerequisite: course 102A-102B.

## 204. Advanced Design.

(HOWARD)

Advanced problems in planning and composition.

45 hrs., first half-year; 15 units. Prerequisite: course 203A-203B.

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\* Not to be given, 1918-19.



**206E-206F. Theory of Architecture.**

(HOWARD)

Continuation of course 106C-106D. Seminar prescribed for students in course 203A-203B.

1 hr., throughout the year; 1 unit each half-year. Th, 5.

**207A-207B. Research and Master's Thesis.**

(HOWARD)

Hours to be arranged. Course 203A-203B must be taken concurrently.

1 unit, first half-year; 4 units, second half-year. Prerequisite: graduate standing and course 102A-102B.

**209A-209B. Professional Practice and Business Relations.**

(HAYS)

Seminar in office practice, working drawings, specifications, and ethics.

1 hr., seminar, 6 hrs., drafting, first half-year; 3 units; 2 hrs., seminar, second half-year; 2 units. Prerequisite: course 102A-102B or 101A-101B and graduate standing.

**216. Graduate Thesis and Seminar.**

(HOWARD)

A course to be arranged individually with students looking toward a degree in architecture. Prerequisite: course 204.

**COURSES IN OTHER DEPARTMENTS**

Strength of Materials. [See Civil Engineering 118A-118B.]

The Materials of Engineering Construction. [See Civil Engineering 8.]

Framed Structures. [See Civil Engineering 107E-107F, 117.]

Sewage Disposal and Water Supply. [See Civil Engineering 127.]

Graphostatics. [See Drawing 105.]

## ASTRONOMY

ARMIN O. LEUSCHNER, Ph.D., Sc.D., Professor of Astronomy and Director of the Students' Observatory.

WILLIAM H. WRIGHT, B.S., Astronomer.

\*RUSSELL T. CRAWFORD, Ph.D., Associate Professor of Practical Astronomy.

STURLA EINARSSON, Ph.D., Assistant Professor of Practical Astronomy.

As part of the lower division courses special lectures are offered by the Director and Astronomers of the Lick Observatory.

Every graduate course may be taken as a seminar course by arrangement with the instructor.

*Honor-students in the Upper Division.*—The following courses are prerequisite to honor-work in the upper division: Mathematics, either 5, 8 and 9, or 3 and 4; Physics 1A-1B. In addition to these, Chemistry 1C and Geology 1A are recommended. A student in the honor-group may be recommended for honors in astronomy at graduation:

1. Upon presenting a satisfactory written report (review or criticism) of some astronomical work (theoretical or practical), an account of which has been printed in some standard astronomical periodical or other publication, or

2. Upon presenting a complete and satisfactory computation in orbit theory or eclipses, or

3. Upon presenting a completed report of some advanced practical work done by the student.

Candidates for honors must prepare a programme at the beginning of their candidacy in consultation with the member of the department designated to supervise their work. On approval of this plan of study, the student will proceed to its completion, attending conferences and making such reports of progress as may be requested.

Honor-students will be allowed much freedom in their studies. To justify this, the work which they do must be consistently of high quality. The department will recommend the exclusion from the honor-group of all students who do not maintain each half-year an average of at least sixty per cent of first and second grades in all their courses and who do not complete their courses in astronomy with high credit. Candidates must fulfill the requirements for a major in astronomy and must enroll for Astronomy 206. (Although this course is listed as a graduate course it may be taken by advanced undergraduates.) A reading knowledge of French and German is required.

An observatory fee of \$2.50 per half-year is charged in courses 2A-2E, 104A-104B, 105, 114.

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\*Absent on leave for the duration of the war.

## LOWER DIVISION COURSES

- 1-2. Elementary Astronomy. (LEUSCHNER)  
A combination of courses 1 and 2A.  
5 hrs., either half-year. The lectures and section work are taken as course 1; the observatory work is taken as course 2A.
1. Elements of Astronomy. (LEUSCHNER)  
An introductory course. General facts and principles underlying the science of astronomy in all its branches.  
3 hrs., either half-year. Lectures, M W F, 10. The classes will be divided into smaller sections in which recitations, examinations, and conferences will be conducted. In the second half-year a separate section, 2 hrs., will be conducted for students who have the equivalent of the entrance requirements in mathematics and physics for the colleges of engineering.
- 2A-2E. Practice in Observing.  
These courses are supplementary to course 1 or 11 or 103A-103B, and are open to students who are taking or have taken any of these courses. The students may enroll for from 1 to 3 units by electing one or more of the divisions specified below.  
All sections meet for organization on the first Thursday of the term at 7 p.m.
- 2A. Practical work at the observatory for beginners, with special emphasis on the elementary methods of determining time, latitude, and longitude. Constellation study. Descriptive observations of celestial objects.  
3 hrs., either half-year; 1 unit.
- 2B. Practical work at the observatory for beginners, with special emphasis on astrophysical and photographic observations. (WRIGHT)  
3 hrs., either half-year; 1 unit. Prerequisite: course 2A.
- 2C. Continuation of course 2A.  
3 hrs., either half-year; 1 unit. Prerequisite: course 2A.
- 2E. The subject matter of courses 2A and 2C.  
6 hrs., either half-year; 2 units.

## COURSE PRIMARILY FOR ENGINEERS

3. Surveyors' Course in the Elements of Spherical Trigonometry and Astronomy. (WRIGHT)  
The principles of spherical trigonometry and astronomy adapted to the needs of students in the colleges of engineering. Computing.  
3 hrs., second half-year; 1 unit. Four sections: I, M, 1-4; II, Tu, 1-4; III, W, 1-4; IV, Th, 1-4. Prerequisite: Civil Engineering 1A. Civil Engineering 1B is to be taken concurrently.

## FREE ELECTIVE COURSES

5. History of Astronomy. (WRIGHT)  
3 hrs., first half-year. M W F, 2. Prerequisite: course 1.
11. Modern Astronomy. (WRIGHT)  
The stars and nebulae. Progress in astronomy through modern methods, especially spectroscopic and photographic.  
3 hrs., second half-year. M W F, 10. Prerequisite: course 1. For observatory work supplementary to this course students may elect course 2B.

## UPPER DIVISION MAJOR COURSES

- 103A-103B. General Astronomy. (WRIGHT)  
The general facts and principles underlying the science of astronomy in all its branches, developed and discussed in detail.  
3 hrs., throughout the year. Hours to be arranged. Prerequisite: Mathematics 5 and Physics 1A-1B. For observatory work in connection with this course students may elect one or more subdivisions of course 2 or 104A-104B, subject to the prerequisites announced.
- 104A-104B. Practical Astronomy. (LEUSCHNER)  
Lectures and observatory work. Practical work at the observatory with sextant, clock, chronograph, transit-and-zenith telescope, equatorial telescope, photographic telescope, reflector, altazimuth instrument. Computing.  
5 hrs., throughout the year; 3 units. Lectures and recitations, Tu Th, 9; observatory work, one evening, 7-10 p.m., to be arranged. Prerequisite: Mathematics 5, Physics 1A-1B, and either course 1 or 103A. The course should also be preceded by a course in differential calculus.
105. Navigation and Nautical Astronomy. (EINARSSON)  
Astronomy as applied to navigation. Use of sextant, chronometer, nautical almanac, nautical tables. Determination of time, latitude, longitude on shipboard. Sailings. Great circle sailing. Lectures, computing, and practice work.  
7 hrs., either half-year; 5 units. Lectures and recitations, Tu Th S, 9; observatory work and computing, two hours twice a week, to be arranged with instructor. Prerequisite: Mathematics C or N11 and N12.
107. Method of Least Squares—Adjustment of Observations. (EINARSSON)  
The fundamental principles and processes of the method of least squares and their application to the solution of astronomical, physical, and engineering problems.  
6 hrs., first half-year; 2 units. W F, recitation or lecture, 1-2, or practical applications, 1-4. Prerequisite: working knowledge of differential and integral calculus.

## 108. Interpolation, Use of Tables, and Mechanical Quadratures.

(EINARSSON)

The more useful formulae of interpolation, and their application in the use of astronomical and other tables. Development of the formulae of numerical differentiation and integration and their application in the construction of tables. Practice in extensive numerical computations, with special aim at rapidity and exactness.

3 hrs., second half-year, to be arranged. Prerequisite: working knowledge of differential and integral calculus.

## \*110. The Theory of Astronomical Refraction.

2 hrs., first half-year, to be arranged. Prerequisite: course 104A or 114.

## \*112. Eclipses.

3 hrs., either half-year, to be arranged. Prerequisite: course 104A or 114.

## 116. Measurement and Reduction of Astronomical Photographs; Spectrograms.

(EINARSSON)

3 hrs., second half-year, to be arranged.

## 117. Astrophysics.

(WRIGHT)

A general review of present-day problems in astrophysics with particular reference to the application of the spectroscope to their solution.

2 or 3 hrs., second half-year, to be arranged.

## COURSE PRIMARILY FOR ENGINEERS

## 114. Practical Astronomy.

(EINARSSON)

The subject matter of course 104 more briefly presented, and adapted to the needs of students of civil engineering.

5-7 hrs., first half-year; 3 units. Two lectures and one observatory period to be arranged. The observatory is open for this course two evenings and one afternoon. The arrangement of the work depends so largely upon weather conditions that the student should reserve for this course several observatory periods. Prerequisite for students in the College of Civil Engineering: Astronomy 3 and Civil Engineering 3.

## GRADUATE COURSES

## 206. Theoretical Astronomy.

(LEUSCHNER)

3 hrs., first half-year. Hours to be arranged. Prerequisite: course 1 or 103A; Mathematics 4 or 109A-109B; ordinarily also Physics 105A. Open to advanced undergraduates.

\* Not to be given, 1918-19.

207. Theoretical Astronomy. (LEUSCHNER)  
 The relative accuracy of the various methods of determining preliminary orbits.  
 3 hrs., second half-year. M W F, 10. Prerequisite: course 206.
- †208A-208B. Introduction to Celestial Mechanics. (LEUSCHNER)  
 3 hrs., throughout the year. M W F, 9.
- †209. Special Perturbations. (LEUSCHNER)  
 3 hrs., first half-year, to be arranged with instructor.
- \*†210A-210B. The General Perturbations of the Minor Planets after Hansen, Newcomb, and Hill.  
 Hours to be arranged.
- \*†212A-212B. Satellite Theory and Introduction to the Lunar Theory.  
 Hours to be arranged. Prerequisite: course 206.
- †213. Selected Topics in Celestial Mechanics. (LEUSCHNER)  
 Either half-year. Hours and credit to be arranged with the instructor.
- \*214. Advanced Practical Astronomy. (EINARSSON)  
 5 hrs., either half-year; 3 units. M W, 11; M, 7-10 p.m. Prerequisite: course 104A-104B.
215. Advanced Study and Research. (The STAFF)  
 Critical discussion and review of current astronomical publications.  
 Investigation of special problems to be selected according to the preparation and the needs of individual students.  
 1 hr., either half-year, to be arranged.
- \*†218. Mathematical Theories in Higher Geodesy.
- \*†219. Physical Theories in Higher Geodesy.

#### COURSES IN OTHER DEPARTMENTS

- Spectroscopy. [See Physics 211-211c.] (LEWIS)
- Railroad Surveying. [See Civil Engineering 102.] (FOOTE)
- Higher Surveying and Geodesy. [See Civil Engineering 105.] (FOOTE)

\*Not to be given, 1918-19.

†These courses form a series which the student can complete in about three years. From two to three of these courses are offered every half-year, the selection being based on the needs and the preparation of the graduate students in astronomy.

**LICK OBSERVATORY**

The Lick Observatory at Mount Hamilton forms a separate department of the University. The unrivaled facilities for advanced astronomical work which are offered by its fine equipment, in this favorable location, are too well known to require description here. The department is open to graduate students under regulations prescribed by the Regents. The degrees of Master of Arts and Doctor of Philosophy are offered to students who have fulfilled the required conditions. (See Announcement of the Graduate Division.) For information relating to graduate work at the Observatory intending students should address the Recorder of the Faculties at Berkeley, or the Director of the Lick Observatory, at Mount Hamilton, Santa Clara County, California.

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**BIOCHEMISTRY**

WALTER R. BLOOR, Ph.D., Professor of Biochemistry.

CHARLES B. BENNETT, Ph.D., Instructor in Biochemistry.

EDWARD S. SUNDSTROEM, M.D., Instructor in Biochemistry.

Announcements of the courses to be offered in biochemistry will be made later.

**BOTANY**

WILLIAM A. SETCHELL, Ph.D., Professor of Botany.

WILLIS L. JEPSON, Ph.D., Associate Professor of Dendrology.

HARVEY M. HALL, Ph.D., Associate Professor of Economic Botany and Assistant Botanist in the Agricultural Experiment Station.

NATHANIEL L. GARDNER, Ph.D., Assistant Professor of Botany.

THOMAS H. GOODSPEED, Ph.D., Assistant Professor of Botany.

TOWNSHEND S. BRANDEGEE, Ph.B., Honorary Curator in the Herbarium.  
Five Assistants.

Courses 2 and 3 lead directly to and are prerequisite for advanced work in botany. Lecture courses in the summer session may be equivalent to course 1A-1B in part, and credit will not be given for both in such a case. Courses 2 and 3 are also designed to fulfill lower division requirements in the College of Agriculture. Laboratory courses in the summer session may be equivalent to courses 2 and 3; credit will not be given for duplicated work.

Courses 104A-104B, 105A, 109A-109B, and 116 are required for major subjects in different divisions of the department of agriculture.

*Honor-students in the Upper Division.*—Of the 24 units of upper division work required for graduation with honors, 18 units should consist of courses 104, 105, 109, the remaining 6 units to be made up preferably from one of the more advanced courses in the department. In special cases, by permission of the head of the department, these 6 units may be taken in some allied department.

Honor-students will be given special opportunities as far as facilities will permit. These may consist of additional working room in the laboratories, of opportunities for herbarium, garden, or field work, or of additional individual attention and guidance from the instructor. If it seems advisable, an honor-student may, after consultation with the instructor, substitute special field, laboratory, or garden studies for a part of the class work regularly required of other students.

For those students who expect to prepare for botanical research or teaching, a broad foundation in related subjects is strongly advised. The fundamental courses in physics and chemistry should be taken, if possible, before the work in botany is begun. Courses in physiology, zoology, and plant pathology may be included to advantage; higher mathematics is desirable; a reading knowledge of French and German is necessary; some knowledge of Latin is very desirable for advanced systematic botany.

A laboratory fee of \$2.50 will be charged each half-year for each laboratory course. This rule applies to courses 2, 3, 104A-104B, 105A-105B, 106A-106B, 107A-107B, 109A-109B, 110, 111A-111B, 112A-112B, 113A-113B, 116.



## LOWER DIVISION COURSES

## 1A-1B. Fundamentals of Botany.

(SETCHELL)

Lectures, illustrated as far as possible by means of specimens, diagrams, and preparations; designed to set forth in a general way the most important facts, problems, and theories with which botanical science is concerned.

3 hrs., throughout the year. M W F, 8. Either 1A or 1B may be taken separately without prerequisite.

## 2. General Botany.

(GARDNER and Assistants)

An elementary laboratory study of the plant, including its general structure and the correlation and individual functions of the various plant organs.

6 hrs., first half-year; 3 units. Lectures, M W, 8. Laboratory, five sections: I, M W, 1-3; II, Tu Th, 8-10; III, Tu Th, 10-12; IV, Tu Th, 1-3; V, Tu Th, 3-5. Prescribed for students in the College of Agriculture and prerequisite to all upper division courses in botany.

## 3. General Botany (continued).

(GARDNER and Assistants)

A continuation of course 2 with special emphasis upon the general characteristics, comparative morphology, and economic importance of representative orders of both spore-bearing and seed-bearing plants.

6 hrs., second half-year; 3 units. Lectures, M W, 8. Laboratory, five sections as in course 2. Prerequisite: course 2. Prescribed for students in the College of Agriculture and prerequisite to all upper division courses in botany.

## UPPER DIVISION MAJOR COURSES

## 104A-104B. General Phaenogamic Botany.

(JEPSON)

104A. Forest Botany. Laboratory work on the botanical characters of forest trees and chaparral; practice in the determination of important California species; lectures on the classification of Gymnosperms and other groups, and on the essentials of morphology and physiology as applied to trees.

6 hrs., first half-year; 3 units. Tu Th, 1-4. Field work on alternate Saturdays. Prerequisite: courses 2 and 3.

104B. Angiosperms. Representative orders of flowering plants, dealing especially with their habits and growth, structure, classification, and geographical distribution. Laboratory work and lectures.

6 hrs., second half-year; 3 units. Tu Th, 1-4, with 3 hrs., field work to be arranged. Prerequisite: course 104A.

## 105A-105B. General Cryptogamic Botany.

(SETCHELL)

The orders of spore-bearing plants from the points of view of structure, development, and economic importance. Laboratory work and informal lectures.

6 hrs., laboratory, 1 hr. lecture, throughout the year; 3 units each half-year. M F, 1-4. Prerequisite: courses 2 and 3. May be taken either half-year by properly qualified students.

## 106A-106B. Phycology and Mycology.

(SETCHELL)

Laboratory work upon the structure, development, and classification of the algae, fungi, and lichens, with informal lectures and the assignment of outside reading. Intended for students who desire some critical knowledge of the lower cryptogamous orders.

6 hrs., throughout the year; 3 units each half-year. M W F, 10-12. Prerequisite: course 105A-105B.

## 107A-107B. Pteridology and Bryology.

(SETCHELL)

The structure, development, and classification of the higher cryptogams (hepatics, mosses, ferns, and fern allies) will be treated in the same way as the lower cryptogams in course 106A-106B.

6 hrs., throughout the year; 3 units each half-year. M W F, 10-12. Prerequisite: course 105A-105B.

## 109A-109B. Physiological Plant Histology.

(GOODSPEED)

A physiological study of the activities of the principal tissue systems of the plant body based upon an examination of their structure.

6 hrs., throughout the year; 3 units each half-year. Tu Th, 9-12. Prerequisite: courses 2 and 3.

## 110. Botanical Microtechnique.

(GOODSPEED)

Laboratory practice in the methods of preparing plant material for microscopical examination. Preservation of tissues, fixation, staining, the paraffin method, the celloidin method and the freezing method. Assigned readings and written reports.

6 hrs., second half-year; 2 units. M W, 9-12. Prerequisite: courses 2 and 3.

## 111A-111B. Vegetable Cytology.

(GOODSPEED)

The anatomy and physiology of the cell, including the cell division, chromosome reduction, fertilization, and a consideration of heredity and development from the standpoint of cytology. Laboratory work and lectures.

6 hrs., throughout the year; 3 units each half-year. M W, 9-12. Prerequisite: courses 2 and 3, 109A-109B and 110.

## 112A-112B. Special Taxonomic Studies.

(JEPSON)

Studies in special morphology of the compositae, leguminosae, pinaceae, or some similar group, mainly from the taxonomic standpoint, followed by the critical examination of various west American genera. At least part of the summer in the year previous to the election of this course should be spent in field work, preferably in California.

6 hrs., throughout the year; 3 units each half-year. Tu Th, 9-12; field work, alt. S, 8-5. Prerequisite: course 104A-104B.

**113A-113B. Taxonomy and Phylogeny of the Phaenogams (JEPSON)**

Characters and affinities of the classes and more important orders of seed plants, accompanied by informal discussion of phylogenetic problems.

6 hrs., throughout the year; 3 units each half-year. M W, 9-12; field work to be arranged. Prerequisite: courses 104A-104B and 105A-105B.

**116. Economic Botany.**

(HALL and Assistants)

Laboratory work on the morphology, classification, geographical distribution, and properties of plants which furnish commercial products and agricultural crops; lectures on the origin, collection, uses, and commerce of plant products.

6 hrs., first half-year; 3 units. Lectures, M W, 8; laboratory, M W, 10-12. Prerequisite: courses 2 and 3; Chemistry 1A-1B.

**GRADUATE COURSES.**

The equipment of the botanical department is fairly complete, permitting a wide range of studies. It includes the following collections:

(1) A phaenogamic herbarium of 170,000 sheets of mounted specimens and a large quantity of unmounted material which is available for use by responsible investigators. The flora of Western America is here better represented than in any other collection, which permits of satisfactory work in preparing revisions or monographs of these plants. The economic section contains representatives of the more common cultivated plants, particularly of those grown in California.

(2) A cryptogamic herbarium consisting of 25,000 mounted sheets. The representation of the west coast algae is undoubtedly the most complete in existence. These collections, together with the ease with which the marine forms may be collected, render the study of cryptogams, and particularly of algae, very satisfactory.

(3) A botanical museum containing valuable sections of woods, barks, cones, etc., available for class and research work.

(4) A botanical garden where native plants are grown and where cultural experiments may be carried on by qualified students.

**225A-225B. Advanced Cryptogamic Botany.**

(SETCHELL)

Advanced and research work on the cryptogamic plants of California, particularly on the algae.

Throughout the year. M W, 10-12. Credit to be arranged.

**226A-226B. Advanced Phaenogamic Botany.**

(JEPSON)

Special problems requiring the original investigation of some particular order or smaller group of flowering plants; involves work in the field as well as in the laboratory.

Throughout the year. M W, 9-12. Credit to be arranged.

- 227A-227B. Advanced Plant Physiology. (GOODSPEED)  
Special problems in plant physiology will be assigned.  
Throughout the year. M W, 2-5. Credit to be arranged.
- 228A-228B. Advanced Economic Botany. (HALL)  
Special problems involving the investigation of some group of plants yielding commercial or agricultural products.  
9 hrs., throughout the year; 3 units each half-year. M W F, 1-4.
- 229A-229B. Advanced Plant Ecology. (HALL)  
Students properly prepared in plant physiology and taxonomy may undertake special problems in plant ecology.  
Throughout the year; hours to be arranged.
- 230A-230B. Botanical Seminar. (SETCHELL and Staff)  
Graduates and advanced undergraduates meet once a week for the discussion of special topics. The head of the department should be consulted.  
1 hr., throughout the year. M, 7 p.m.

**CELTIC**

WILLIAM W. LYMAN, JR., M.A., Instructor in Celtic and English.

**LOWER DIVISION COURSE**

- 1A-1B. Elementary Modern Irish. (LYMAN)  
Essentials of grammar; stories and poems by contemporary writers.  
3 hrs., throughout the year; 3 units each half-year. M W F, 1.

**UPPER DIVISION MAJOR COURSES**

101. Modern Irish: Advanced Course. (LYMAN)  
Prose romances of the eighteenth and nineteenth centuries.  
3 hrs., first half-year, to be arranged.
- 102A-102B. Modern and Early Welsh. (LYMAN)  
Designed to give a student a reading knowledge of the language.  
3 hrs., throughout the year; 3 units each half-year. M W F, 1.  
Either course 1A-1B, or 102A-102B will be given, depending upon the  
needs and wishes of the students.
106. Old and Middle Irish. (LYMAN)  
The old forms of the Irish tongue with the reading of several of  
their chief literary monuments.  
2 hrs., second half-year, to be arranged. Open to qualified students  
without a previous knowledge of Celtic.
- 150A-150B. The Development of Irish Philology and Literature. (LYMAN)  
Special problems.  
Throughout the year; hours to be arranged.

**GRADUATE COURSE**

201. Seminar. (LYMAN)  
Intensive study of Old Irish documents with discussions of the relation  
of the language to comparative philology.  
3 hrs., either half-year, to be arranged.

**CHEMISTRY**

- \*GILBERT N. LEWIS, Ph.D., Professor of Physical Chemistry.  
EDMOND O'NEILL, Ph.B., Professor of Inorganic Chemistry and Director of the Chemical Laboratory, and Dean of the College of Chemistry.  
WILLIAM C. BRAY, Ph.D., Professor of Chemistry.  
\*JOEL H. HILDEBRAND, Ph.D., Professor of Chemistry.  
WALTER C. BLASDALE, Ph.D., Associate Professor of Chemistry.  
MERLE RANDALL, Ph.D., Assistant Professor of Chemistry.  
CHARLES W. PORTER, Ph.D., Assistant Professor of Chemistry.  
\*WENDELL, M. LATIMER, A.B., Lecturer in Chemistry.  
GEORGE E. GIBSON, Ph.D., Assistant Professor of Chemistry.  
\*WILLIAM L. ARGO, Ph.D., Instructor in Chemistry.  
\*GERALD E. K. BRANCH, Ph.D., Instructor in Chemistry.  
ERMON D. EASTMAN, Ph.D., Instructor in Chemistry.  
\*THOMAS D. STEWART, Ph.D., Instructor in Chemistry.  
Two Teaching Fellows.  
Fourteen Assistants.

Matriculation chemistry, subject 12b, is usually prerequisite to all courses in chemistry, excepting courses 1c and 1d. To students who have not taken chemistry in the high schools an opportunity to take an equivalent course is offered during the summer session of the University.

Courses 1c and 1d are not open to students who have credit for matriculation chemistry, nor to those who have taken or are taking course 1A-1B.

Course 1A-1B is prerequisite to all further courses in chemistry. Students who plan to take advanced work in chemistry should have begun courses 6A-6B, 8, 9 and 110 before proceeding to further work in chemistry. A thorough training in mathematics and physics should not be neglected.

All undergraduate students from other institutions, who desire to take courses in chemistry more advanced than course 1A-1B, must present themselves to Mr. Blasdale on or before the date of their registration for an informal examination or test of their fitness to undertake such work. In cases of doubt, such students will be required to enter a probation course of not more than two weeks' duration.

All students, whether in the College of Chemistry or in the College of Letters and Science, who propose to enter any branch of pure or applied chemistry as a profession are recommended to submit their proposed schedules to Mr. O'Neill, 114 Gilman Hall. Whether the student intends

\* Absent on leave for the duration of the war.

to prepare himself for research in governmental, industrial, or educational institutions, for teaching, for analytical chemistry, manufacturing chemistry, the chemistry of petroleum or any of the other branches of chemical engineering, it is desirable that a complete schedule of courses, chosen with a definite purpose and free from conflicts, be arranged at the earliest possible date. A general schedule for students in chemical engineering will be found in the announcement of the College of Chemistry in the Circular of Information.

A fee of \$5 will be charged for each unit of laboratory work in undergraduate courses; for example, \$10 for 1A-1B, 5, 6A-6B, and 9. The fee for course 180H is an exception to this rule and is \$10 irrespective of the number of hours taken. In addition to the fee, a deposit of \$5 must be made for each undergraduate course and this deposit, less the cost of apparatus destroyed, will be returned at the end of the half-year.

The chemical laboratories are well equipped for research work, and are open to properly qualified graduate students, not only during the college year, but also throughout the summer vacation.

*Honor-students in the Upper Division.*—Students in the College of Chemistry, and those in the College of Letters and Science who have a major in chemistry, are urged, when eligible, to enroll at the beginning of their junior year as candidates for honors. Honor-students will be given a larger share of personal instruction and a greater opportunity to choose courses, and work within courses, in a manner best suited to individual needs and aims. Students not in the honor-group will not, except under unusual circumstances and with the express permission of the instructor, be permitted to enroll for honor-courses (marked H) nor for undergraduate research. Students in the College of Letters and Science enrolled in the honor-group will not be recommended for honors in chemistry at graduation unless their work includes courses 6A-6B, 8, 9, 110, 114H and 180H. Students enrolled in the honor-group should confer with Mr. Bray, Chairman of the Committee on Honors in Chemistry, regarding their whole plan for the last two years of college work.

#### LOWER DIVISION COURSES

\*1c. Elements of Chemistry.

(O'NEILL)

Lectures on the general principles of chemistry, with experimental illustration.

2 hrs., first half-year. Tu Th, 10.

\*1d. Elements of Chemistry.

(O'NEILL)

The principles of chemistry with special consideration of applications to the manufacturing industries. Lectures, fully illustrated by experiments.

2 hrs., second half-year. Tu Th, 8.

\*Not to be given, 1918-19.

## 1A-1B. General Inorganic Chemistry and Qualitative Analysis.

3 hrs., lectures and quiz, and 4 hrs. laboratory work, throughout the year; 5 units each half-year.

Lectures and quiz. (LATIMER, BRAY, BLASDALE, GIBSON, EASTMAN)

Two sections: M W F, 9; M W F, 10.

Laboratory. (BRAY, BLASDALE, GIBSON, EASTMAN, LATIMER)

Four sections: I, M F, 1-3; II, Tu Th, 9-11; III, Tu Th, 1-3; IV, W, 1-3; S, 9-11. Prerequisite: matriculation chemistry, subject 12b. In special cases students who have credit for matriculation physics may be allowed to take this course without the chemistry prerequisite, but in no case without the written consent of the instructor.

## 5. Quantitative Analysis—Gravimetric and Volumetric. (BLASDALE)

Short course in the principles and methods of quantitative analysis; for students who do not intend to take further work in chemistry.

7 hrs., first half-year; 3 units. Lecture, W, 1; laboratory, M F, 1-4.

## 6A-6B. Quantitative Analysis—Gravimetric and Volumetric.

(BLASDALE, GIBSON)

Full course in the principles and methods of quantitative analysis.

7 hrs., throughout the year; 3 units each half-year. Two sections: lecture, Tu, 1; laboratory, Tu, 2-5; Th, 1-4.

## 8. Elements of Organic Chemistry.

(PORTER)

An introductory study of the compounds of carbon. Recitations and lectures with experimental illustrations. Laboratory course 9 should, if possible, accompany this course.

3 hrs., either half-year. Tu Th S, 8.

## 9. Elements of Organic Chemistry: Laboratory.

(PORTER)

A comparative experimental study of the physical properties and chemical reactions of the more commonly occurring classes of organic substances. Consists of two three-hour laboratory periods and one quiz.

7 hrs., either half-year; 3 units. Sec. I, M, 1-5, S, 9-12; Sec. II, W, 1-5; F, 1-4; Sec. III, Tu, 1-5, Th, 1-4.

## UPPER DIVISION MAJOR COURSES

## 100. Organic Chemistry: Laboratory.

(PORTER)

Continuation of course 9. The preparation of organic compounds and the study of their properties, including methods of analysis.

6 hrs., second half-year; 2 units. M F, 1-4. Prerequisite: courses 8 and 9.

## 101. Organic Chemistry: Laboratory.

(PORTER)

Continuation of course 100.

6 hrs., first half-year; 2 units. M F, 1-4.



- 102A-102B. Advanced Organic Chemistry. (PORTER)  
Lectures and discussions.  
3 hrs., throughout the year; 3 units each half-year. M W F, 9. Prerequisite: Courses 8 and 9, and a reading knowledge of German.
110. Elementary Physical Chemistry. (EASTMAN)  
Required for all later work in physical chemistry and designed also to meet the needs of students in allied sciences.  
3 hrs., second half-year. Tu Th, 11; W, 4. Prerequisite: course 5 or 6A; Physics 1A-1B or 2A-2B.
- 111, 111H. Physical Chemistry: Laboratory. (EASTMAN)  
Physico-chemical problems and measurements. Prerequisite: course 110.  
111.—10 hrs., first half-year; 4 units. Tu W Th, 1-4, and an additional hour.  
111H.—9 hrs., first half-year; 3 units. Tu W Th, 1-4.
- 114H. Thermodynamics. (GIBSON)  
The principles of thermodynamics, with examples of their application to chemistry.  
3 hrs., first half-year. M W F, 10. Prerequisite: courses 6A-6B, 110; Physics 1A-1B, 2C-2D or 2A-2B, 3A-3B; mathematics, familiarity with differential and integral calculus.
- 116H. Advanced Physical Chemistry and Electro-Chemistry. (GIBSON)  
3 hrs., second half-year. M W F, 10. Prerequisite: courses 111H and 114H.
- 120, 120H. Advanced Inorganic Chemistry. (BRAY)  
Preparation and experimental study of substances, designed primarily to illustrate the factors which influence equilibrium and the speed of chemical reactions. Correlation of material by means of the periodic system.  
7 hrs., second half-year; 3 units. Lecture, Tu or Th, 10; laboratory, Tu, 1-4, and one other three-hour period to be arranged. Prerequisite: course 6A-6B (5 only by special permission).
- 121, 121H. Advanced Inorganic Chemistry. (BRAY)  
Continuation of course 120, including advanced qualitative analysis with some study of the rare elements.  
7 hrs., first half-year; 3 units. Lecture, Th, 10; laboratory, Tu, 1-4, and one other three-hour period to be arranged. Prerequisite: course 120 or 120H.
122. Applications of the Phase Rule. (BLASDALE)  
The use of the Phase Rule in the treatment of a variety of chemical problems, especially those of practical interest.  
2 hrs., second half-year. Tu Th, 11. Prerequisite: course 110.

124. Advanced Quantitative Analysis. (BLASDALE)  
The theory and use of special methods of quantitative analysis, including physico-chemical methods and electro-analysis.  
6 hrs., first half-year; 2 units. Conference hour, W, 2; five laboratory hours, to be arranged.
- \*126. Gas and Fuel Analysis.  
The principles and methods of accurate gas analysis.  
4 hrs., first half-year; 2 units. Lecture, M, 1; laboratory, F, 1-4. Prerequisite: course 6A-6B.
- 140A. General Chemical Technology. (O'NEILL)  
The processes employed in chemical manufacturing; installation of large scale apparatus, management, and costs.  
2 hrs., first half-year. Tu Th, 8. Prerequisite: courses 6A-6B, 8, 9, 110, 111.
- 140B. Chemical Technology. (O'NEILL)  
Continuation of course 140A, with special reference to the chemical technology of the Pacific Coast.  
2 hrs., second half-year. Tu Th, 10. Prerequisite: courses 6A-6B, 8, 9, 110, 111.
141. Chemical Technology: Laboratory. (O'NEILL)  
Laboratory work supplementary to courses 140A and 140B. Large scale preparation of commercial chemicals, with special reference to the petroleum industry. Experimental study of technical processes. Methods of technical analysis.  
6 hrs., first half-year; 2 units. Tu F, 1-4. Prerequisite: same as for course 140A.
145. Applied Electro-chemistry. (RANDALL)  
Lectures and laboratory exercises dealing with certain fundamental electro-chemical processes, and with the chemical, physical, and economic factors involved in electro-chemical technology.  
7 hrs., first half-year; 3 units. Lecture, Tu, 10; laboratory, M F, 1-4. Prerequisite: courses 110 and 111.
160. History of Chemistry. (O'NEILL)  
The development of modern chemistry.  
2 hrs., first half-year. Tu Th, 9. Prerequisite: courses 5, 8, 110.
179. Special Laboratory Work.  
Students may be given an opportunity to carry on laboratory work along lines in which they are specially interested, and for which they are specially qualified. Such work can be undertaken under the direction of any member of the instructing staff who is willing to supervise it.  
6 to 9 hrs., either half-year; 2 to 3 units. Hours to be arranged.

\*Not to be given, 1918-19.

## 180H. Chemical Research.

Students who have completed with high credit a satisfactory number of advanced courses may prosecute original research representing not less than 4 units of experimental work under the direction of one of the members of the instructing staff. The explicit consent of the instructor must be obtained.

## 190H. Pro-seminar in Chemistry.

(The STAFF)

See course 290.

## 199H. Special Reading Course.

(The STAFF)

Reading and conference for individual honor-students. Credit to be arranged.

These pro-seminar courses will, in certain cases, be combined with the corresponding graduate seminars 290, etc. (See note under these courses.)

## GRADUATE COURSES

## 280. Graduate Research.

The laboratory is open at all times to graduate students who wish to prosecute original investigations. Such work will ordinarily be under the direction of some member of the instructing staff who will determine the credit value of the work.

## 290. Graduate Seminar in Chemistry.

(The STAFF)

As a rule two seminars are offered in each half-year. The subjects will vary from year to year and will be announced at the beginning of each half-year. In certain cases courses 190H and 290 will be combined.

*Research Conference.*—Members of the instructing staff and students engaged in graduate research meet once a week to discuss the various investigations in progress in the laboratory. M or W, 11. No credit.

*Chemical Colloquium.*—In addition to the seminar courses, an evening colloquium will be held bi-weekly each half-year for the presentation and discussion of recent advances in chemistry and allied sciences. No credit.

## COURSES IN OTHER DEPARTMENTS

Physiological Chemistry. [See under Biochemistry.]

Metallurgy and Assaying. [See under Mining and Metallurgy.]

Minerals and Blowpipe Analysis. [See under Geology and Mineralogy.]

Sanitary Chemistry and Water Analysis. [See under Civil Engineering.]

Electric Discharges through Gases. [See under Physics.]

## COURSES IN THE DEPARTMENT OF AGRICULTURE

Chemistry of Soils and Fertilizers. [See under Soils and Fertilizers.]

Chemistry of Milk. [See under Dairy Industry.]

Chemistry of Wine. [See under Viticulture.]

Analysis of Agricultural Products. [See under Agricultural Chemistry.]

Food Analysis. [See under Nutrition.]

## CIVIL ENGINEERING

CHARLES DERLETH, JR., C.E., Professor of Civil Engineering and Dean of the College of Civil Engineering.

<sup>2</sup>CHARLES G. HYDE, B.S., Professor of Sanitary Engineering.

FRANCIS S. FOOTE, JR., E.M., Professor of Railroad Engineering.

ARTHUR C. ALVAREZ, B.S., Assistant Professor of Civil Engineering.

<sup>2</sup>ADOLPHUS J. EDDY, B.S., Assistant Professor of Civil Engineering.

WILFRED F. LANGELIER, M.S., Assistant Professor of Sanitary Engineering.

CLEMENT T. WISKOCIL, C.E., Assistant Professor of Civil Engineering.

<sup>3</sup>EDWIN D. HAYWARD, B.S., Instructor in Civil Engineering.

PAUL A. SWAFFORD, B.S., Instructor in Civil Engineering.

VALDEMAR ARNTZEN, Expert Mechanic in Civil Engineering Laboratory.

H. H. HARDER, Helper in Testing Laboratory.

*Laboratory Fees.*—\$5 a half-year for courses 1A-1B, 1E, 102; \$7.50 for 123 and 128; \$10 for 108C, 108E, 108F; and \$20 each for 3 and 103.

*Honors.*—Students will be recommended for honors on the basis of the quality of the work done in the regular curriculum of the senior year. Particular emphasis will be placed upon the thesis.

## LOWER DIVISION COURSES

## 1A-1B. Plane Surveying.

(FOOTE, ALVAREZ, LANGELIER, WISKOCIL, SWAFFORD, and Assistants)

Methods of plane surveying; field practice; calculations, and mapping.

4 hrs., throughout the year; 3 units each half-year. Recitation sections: I, II, III, M F, 8; IV, M F, 9; V, Tu Th, 11; VI, Tu Th, 8. Field and drafting sections: I, M, 1-3; II, Tu, 9-11; III, Tu, 1-3; IV, Th, 9-11; V, F, 1-3. Prescribed, freshman year, in the colleges of engineering. Prerequisite: plane trigonometry. Fee, \$5 each half-year.

## 1E. Plane Surveying.

(FOOTE, ALVAREZ, LANGELIER, WISKOCIL, SWAFFORD, and Assistants)

The more elementary parts of course 1A-1B briefly presented. Open only to students of agriculture and architecture.

4 hrs., either half-year; 3 units. Tu Th, 11; W or Th, 1-3. Fee, \$5. Prerequisite: plane trigonometry.

<sup>3</sup> Absent on leave for the duration of the war.

3. Summer Class in Plane Surveying. (FOOTE, ALVAREZ, LANGELIER, WISKOCIL, SWAFFORD, EINARSSON, and Assistants)  
Four weeks; 3 units. Begins the day after Commencement. The summer school site is near Santa Cruz. Fee, \$20. Prerequisite: course 1A-1B.
8. The Materials of Engineering Construction. (ALVAREZ, WISKOCIL)  
The structural properties and adaptability of various materials employed in engineering construction.  
2 hrs., second half-year. Sections I and II, Tu Th, 8. Prerequisite: sophomore standing.
- 25 Plumbing, Heating, Ventilating, and Lighting. (LANGELIER)  
For students of public health and sanitary engineering.  
2 hrs., first half-year. Tu Th, 9. Prerequisite: Physics 1A-1B, Chemistry 1A-1B, Hygiene 1, or equivalents.

## UPPER DIVISION MAJOR COURSES

101. Advanced Plane Surveying. (FOOTE)  
Additional study of the methods used in topographic and hydrographic surveying, and in triangulation. For students in Military Engineering.  
1 hr., second half-year. Prerequisite: course 3.
102. Railroad Surveying. (FOOTE, SWAFFORD)  
Simple, compound, and transition curves; reconnaissance, preliminary and location surveys; calculations of earthwork and other quantities; field work, such as running in curves, etc.  
5 hrs., first half-year; 3 units. Lectures, Tu Th, 8; field work, Tu, 1-4. Prerequisite: course 3. Fee, \$5.
- 102c. Railroad Engineering Office Practice. (FOOTE)  
The plotting of railroad maps and profiles; calculation of volumes of masonry and earthwork; drafting of railroad structures.  
3 hrs., second half-year; 1 unit. Tu, 1-4. Prerequisite: course 102.
103. Summer Class in Railroad Surveying.  
(FOOTE, ALVAREZ, LANGELIER, WISKOCIL, SWAFFORD)  
Four weeks, beginning the day after Commencement; 3 units.\* Fee, \$20. Prerequisite: courses 3 and 102.
- 104A. Economics of Railroad Location. (FOOTE)  
Influence of railroad location upon profit-producing value, with particular reference to the effect of distance, curvature, and grades upon operating expenses.  
3 hrs., first half-year. M W F, 10. Prerequisite: course 102.

- \*104B. Railroad Construction and Maintenance.** (FOOTE)  
 Grading, tunneling, waterways, track laying; the materials and methods used in maintenance work; signaling and interlocking; yards and terminals.  
 3 hrs., second half-year. M W F, 10. Prerequisite: course 102.
- \*105. Higher Surveying and Geodesy.** (FOOTE)  
 Methods of geodetic surveying; adjustment of observations; geodetic positions; map projections.  
 2 hrs., second half-year. Tu Th, 11. Prerequisite: course 3; Astronomy 3 and 107.
- 106. Highway Engineering.** (FOOTE, ALVAREZ)  
 The location, design, construction, and maintenance of roads and streets; the construction and maintenance of pavements.  
 2 hrs., first half-year. Tu Th, 11. Prerequisite: course 8.
- 107A. Framed Structures.** (WISKOCIL)  
 The computation of stresses in roofs, building frames, and simple bridge trusses, chiefly by analytical methods.  
 5 hrs., second half-year; 3 units. W F, 8; Th, 1-4. Open to students in civil engineering who have taken, or who are taking courses 108A-108B, Mechanics 102A-102B or Physics 105A-105B, and Drawing 105.
- 107C-107D. Framed Structures.** (DERLETH)  
 Continuation of course 107A. Stress computations for steel-framed structures; the design of plate girders, roof, and bridge trusses; bridge shop practice.  
 5 hrs., throughout the year; 3 units each half-year. Tu Th, 10; W, 1-4. Prerequisite: courses 107A and 108A-108B.
- 107E-107F. Framed Structures.** (ALVAREZ)  
 For architectural students. Stress computations and design of structures in wood, steel, and reinforced concrete, particularly of buildings; foundations and retaining walls; structural specifications.  
 5 hrs., throughout the year; 3 units each half-year. Tu Th, 8; M, 1-4. Prerequisite: courses 117 and 118A-118B.
- 108A-108B. Strength of Materials.** (DERLETH, and Assistants)  
 The elastic and ultimate resistance of materials; stress analysis for bars, beams, columns and shafts; theory of resilience; deflections and combined stresses; elements of design for wood, steel, and reinforced concrete structures.  
 3 hrs., first half-year, M W F, 9, and 2 hrs., second half-year, M W, 9. Prerequisite: Mathematics 4A-4B. Physics 105A-105B or Mechanics 102A-102B must be taken concurrently.

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\* Not to be given, 1918-19.

- 108C. Civil Engineering Laboratory. (ALVAREZ, WISKOCIL)  
Physical tests of timber, metals, brick, plain and reinforced concrete, macadam and asphaltic road materials.  
6 hrs., first half-year; 2 units. Laboratory period, M, 1-4; computing periods to be arranged. Prerequisite: courses 8 and 108A-108B. Students in sanitary engineering and in irrigation may take part of the complete course, credit, 1 unit. Fee, \$10 for 2 units, \$5 for 1 unit.
- 108E. Civil Engineering Laboratory. (ALVAREZ, WISKOCIL)  
Physical tests of cement, mortars, plain and reinforced concrete.  
3 hrs., second half-year; 1 unit. M, 1-4. Prerequisite: course 8 and satisfactory standing in 108A-108B. Fee, \$10.
- 108F. Civil Engineering Laboratory. (ALVAREZ, WISKOCIL)  
Physical tests of cement, concrete, timber, metal, and bricks.  
3 hrs., second half-year; 1 unit. M, 1-4. Elective for students of architecture only. Fee, \$10.
- 109A. Sewerage Engineering. (FOOTE, LANGELIER)  
The design and construction of sewerage works.  
2 hrs., first half-year. M W, 8. Prerequisite: course 110.
- \*109B. Sewage and Sewage Disposal. (HYDE)  
The chemical and biological character of sewage; its treatment and disposal.  
1 hr., first half-year. Tu, 9. Prerequisite: Chemistry 5 and 8, Bacteriology 1.
110. Hydraulics. (FOOTE)  
Theory of hydraulics; application of principles; water measuring devices; stream gauging.  
5 hrs., first half-year; 3 units. Tu Th, 10; Th, 1-4. Prerequisite: Mathematics 4A-4B. Physics 105A-105B or Mechanics 102A-102B must be taken concurrently.
- 111A. Water Supply Engineering. (FOOTE, LANGELIER)  
The design and construction of water works.  
2 hrs., second half-year. Tu Th, 11. Prerequisite: course 110.
- \*111B. Character and Sanitation of Water Supply. (HYDE)  
Water from the aesthetic, commercial, and sanitary points of view; water purification.  
1 hr., second half-year. M, 10. Prerequisite: Chemistry 5 and 8; Bacteriology 1; Zoology 109C.

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\* Not to be given, 1918-19.

- \*112. Dams of Timber, Masonry, and Earth. (HYDE)  
1 hr., first half-year. W, 11. Prerequisite: junior standing.
113. Foundations of Structures. (DERLETH, and Assistants)  
Ordinary foundations, footings, sheet piling, piles, coffer-dams, open caissons, the pneumatic process; deep well dredging.  
2 hrs., first half-year. Tu Th, 8. Prerequisite: course 108A-108B.
114. Masonry Structures. (DERLETH)  
Design of typical masonry structures, such as dams, retaining walls, bridge piers, abutments, culverts, aqueducts, chimneys, stone and concrete arches, and arch bridges.  
5 hrs., second half-year; 3 units. Tu Th, 8; W, 1-4. Prerequisite: course 108A-108B.
- \*115. Fire-proofing. (ALVAREZ)  
The resistance of building materials to fire; fire resistive and slow-burning construction; fire extinguishing equipment; corrosion and preservation of structural metal.  
2 hrs., first half-year. M W, 11. Elective for students of civil engineering and architecture. Course 108A to be taken concurrently.
- \*116. Engineering Contracts and Specifications. (HYDE)  
Contracts, specifications, engineering relations, principles of engineering economics.  
2 hrs., second half-year. M W, 9. Prerequisite: junior standing.
117. Framed Structures. (SWAFFORD)  
The computation of stresses in roofs, building frames and other structures, chiefly by analytical methods.  
5 hrs., second half-year; 3 units. M W, 10; M, 1-4. Prescribed for architectural students who are taking course 118A-118B and Drawing 105.
- 118A-118B. Strength of Materials. (ALVAREZ)  
The elastic and ultimate resistance of materials; stress analysis for bars, beams, and columns; theory of resilience; deflections and combined stresses. Application of statics and the theory of the elasticity and strength of structural materials to the elements of design for buildings.  
3 hrs., throughout the year; 3 units each half-year. M W F, 9. Prerequisite: Mathematics 4A-4B, Physics 1A-1B, Civil Engineering 8. Prescribed for students of architecture.

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\*Not to be given, 1918-19.



## 119. Thesis for B.S. Degree.

For the regulations governing thesis work see the annual Circular of Information, Academic Departments. Candidates for B.S. who elect a thesis in the department of Civil Engineering will register, during both half-years, of the last or senior year, for Civil Engineering 119. Candidates who elect their theses in other departments will register according to announcements of those departments.

Students who contemplate theses in the civil engineering laboratories should notify the department before December of the junior year.

2 units each half-year.

## 123. Sanitary Engineering Laboratory. (LANGELIER)

The chemical and biological examination of water and sewage, with particular reference to the analytical control of water purification and sewage treatment plants. Required of sanitary engineering students, but arrangements will be made for instruction of students in other departments.

9 hrs., first half-year; 3 units. M Tu W, 2-5. Prerequisite: Chemistry 5, or equivalent. Fee, \$7.50.

## 124. Elementary Water Supply, Sewerage, and Municipal Wastes Engineering. (LANGELIER)

Water supply and sewage works; purification of water; treatment of sewage and the disposal of refuse. Designed primarily for students of public health.

3 hrs., second half-year. M W F, 8. Prerequisite: junior standing.

## 125. Plumbing, Heating, Ventilating, and Lighting. (LANGELIER)

For students of home economics.

2 hrs., first half-year. M W, 11. Prerequisite: junior standing.

## \*126. Applied Sanitary Science and Municipal and State Sanitation.

(HYDE)

The application of the principles of sanitary science to the work of municipal and state sanitation.

2 hrs., second half-year. Tu Th, 9. Prerequisite: Zoology 109c, Bacteriology 1, Chemistry 5 and 8, and Civil Engineering 109b.

NOTE.—Special arrangements will be made for students in other courses and in other departments who may desire to take this course.

## 127. Sewage Disposal and Water Supply. (LANGELIER)

Lectures and recitations, with outside reading on public and private water supply and sewage disposal installations. Arranged for students of architecture.

2 hrs., first half-year. Tu Th, 11. Prerequisite: junior standing.

## 128. Sanitary Engineering Laboratory.

(LANGELIER)

The chemical and biological examination of water and sewage. Laboratory exercises and lectures on the interpretation of analyses. For students of public health; may be elected by students in other departments.

9 hrs., second half-year; 3 units. M Tu W, 2-5. Prerequisite: Chemistry 1A-1B. Fee, \$7.50.

## GRADUATE COURSES

## \*220A-220B. Framed Structures.

(DERLETH)

The design of continuous girders, swing, cantilever, suspension and metallic arch bridges, and of reinforced concrete structures.

Throughout the year. Programme of work to be arranged each year. Prerequisite: course 107C-107D.

## \*221A-221B. Theory of Resilience and Deflections.

(DERLETH)

Applications to the statically indeterminate structures.

Throughout the year. Programme of work to be arranged in each case. Prerequisite: course 107C-107D.

## \*222A-222B. Sanitary Design.

(HYDE)

The design of elements of systems for water supply, water purification, sewerage, sewage and refuse treatment and disposal, etc.

Throughout the year. Individual assignments. Prerequisite: courses 109A, 109B, 110, 111A, and 111B.

## 223. Laboratory Experiments.

(DERLETH, ALVAREZ, WISKOCIL)

For advanced work in civil engineering the testing laboratory is equipped with apparatus specially designed to make tests and original studies upon the strength and elasticity of structural materials. Programme of work to be arranged in each case. Prerequisite: courses 8, 108A-108B, 108C, and 108E.

## \*224. Harbor Engineering.

(ALVAREZ)

Harbor planning; design and construction of breakwaters and docks; river improvements.

1 or 2 hrs., first half-year, to be arranged.

## \*225. Advanced Sanitary Engineering Laboratory. (HYDE and LANGELIER)

Special laboratory problems in water, sewage, air, and refuse analysis; tests of apparatus, experimental or practical, in available localities.

Programme of work to be arranged in each case. Prerequisite: course 123. Fee, \$2.50 per unit.

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\*Not to be given, 1918-19.

## DRAWING AND ART

HERMANN KOWER, C.E., Associate Professor of Drawing.  
 C. CHAPEL JUDSON, Assistant Professor of Antique Drawing.  
 WILLSON J. WYTHE, B.S., Assistant Professor of Mechanical Drawing.  
 EUGEN NEUHAUS, Assistant Professor of Decorative Design.  
 OLIVER M. WASHBURN, A.B., Assistant Professor of Classical Archaeology.  
 PERHAM W. NAHL, Assistant Professor of Freehand Drawing and Art Anatomy.  
 ROSS J. BROWER, B.S., Instructor in Drawing.

*Honor-students in the Upper Division.*—Prospective candidates for honors must have the permission of the department before undertaking upper division work, and permission will be granted only to those who have shown proficiency in the lower division work and who have passed such examinations in the elementary subjects as may be required by the department. Credit for advanced work done in other institutions will be given only upon a satisfactory test in correlated lower division subjects.

Graphic Art.—Courses A-B, 1, 6, 7, and Engineering Drawing CD and 9 are normally prerequisite to honor-work in the upper division. The requirement of 24 units in major courses must normally include courses 102, 114, 115, 116 or 117, 118, 127, 128. Students are advised to elect Philosophy 36A-36B and to take the teachers' course offered in the summer session during the last year in college. Candidates of marked ability who have taken 24 units of varied upper division work with excellent results will be recommended for honors. A command of scientific and artistic perspective, creative ability in design as well as in color, and a thorough knowledge of art anatomy will be regarded as essential.

Engineering Drawing.—Courses CD, 3A, 3B, 3C, 9, Graphic Art A-B, Architecture 11, Mechanics 6A, and Civil Engineering 1E, are normally prerequisite to honor-work in the upper division. The requirement of 24 units in major courses must normally include courses 105, 107A-107B, 109, 110, 125, Architecture 101A-101B, 106A-106B, Mechanics 106B and Mathematics 113. Candidates will be recommended for honors on the basis of the quality of the work done in the regular curriculum.

## ENGINEERING DRAWING

### LOWER DIVISION COURSES

CD. Instrumental Drawing. (WYTHE and BROWER)

Use of instruments; solving of geometrical problems; construction of mathematical curves; lettering; technical drawings.

6 hrs., either half-year; 2 units each half-year. Two sections: I, M F, 1-4; II, Tu Th, 1-4.

3. Descriptive Geometry. (KOWER, WYTHE and BROWER)  
 Courses 3A, 3B and 3C are intended for students in architecture, candidates for teachers' recommendations and honor-students.
- 3A. Problems on points, lines and planes.  
 6 hrs., first half-year; 2 units. M F, 1-4. Prerequisite: course CD or matriculation subject 17.
- 3B. Problems on solids, warped and irregular surfaces.  
 6 hrs., second half-year; 2 units. M F, 1-4. Prerequisite: course 3A.
- 3C. Problems on shades, shadows and perspective.  
 6 hrs., first half-year; 2 units. Tu Th, 1-4. Prerequisite: course 3B, or course 3D.
- 3D. An abridgment of courses 3A and 3B. For engineering students.  
 9 hrs., either half-year; 3 units. Two sections: I, Tu Th S, 9-12; II, Tu W Th, 1-4. Prerequisite: same as for course 3A.
9. Lettering. (WYTHE)  
 Freehand and instrumental; various alphabets; construction of titles.  
 3 hrs., either half-year; 1 unit. First half-year: M, 1-4; second half-year: Tu, 1-4. Prerequisite: course CD or matriculation subject 17.

#### UPPER DIVISION MAJOR COURSES

- 101A-101B. Teachers' Training Course in Mechanical Drawing. (WYTHE)  
 Various courses given in the secondary schools; methods of teaching; examination of text-books; visiting schools; drawing with criticism.  
 1 hr., throughout the year; 1 unit each half-year. Th, 4. Prerequisite: senior or graduate standing.
105. Graphostatics. (KOWER, WYTHE and BROWER)  
 Graphic analysis of stresses in engineering structures.  
 2 hrs., second half-year; 2 units. Three sections: I, W, 2-4; II, Th, 2-4; III, F, 2-4. Prerequisite: Civil Engineering 108A and Physics 105A or Mechanics 102A.
- 107A-107B. Construction. (KOWER)  
 Continuation of course 105, including the designing of engineering structures, such as roof-trusses, bridges, etc.  
 6 hrs., throughout the year; 2 units each half-year. M F, 1-4.
109. Advanced Lettering. (WYTHE)  
 Continuation of course 9.  
 3 hrs., either half-year; 1 unit. Hours to be arranged. Prerequisite: course 9.

110. Stereotomy.

(KOWER)

Continuation of course 3D, intended for students of architecture.

6 hrs., first half-year; 2 units. M F, 1-4.

125. Perspective.

(WYTHE)

Continuation of course 3C, intended for those preparing to teach and for students of architecture.

3 hrs., second half-year; 2 units. M, 1-4.

GRADUATE COURSE

224A-224B. Seminar in Mechanical Drawing.

(KOWER, WYTHE and BROWER)

Advanced work in mechanical drawing for graduate students.

Hours to be arranged.

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GRAPHIC ART

LOWER DIVISION COURSES

A-B. Elementary Freehand Drawing.

(NAHL)

Drawing in pencil from models, embracing the study of light and shade and perspective; drawing from memory; lectures.

3 hrs., throughout the year, beginning either in September or February; 1 unit each half-year. Three sections: I, M, 1-4; II, W, 1-4; III, F, 1-4. This course is equivalent to matriculation subject 16.

1A-1B (or 1C). General History of Art.

(WASHBURN and NEUHAUS)

Lectures on the development of art in the western world from the palaeolithic age to the present century.

1A. The first half-year's work extends through the art of Egypt, Mesopotamia, Greece, and Rome to the early Christian and Byzantine periods.

1B. The second half-year's work deals with the art of the Renaissance and modern periods in Europe, alternating with

\*1C. which deals with the development of the fine arts, particularly painting, in our own country.

Sections will be provided for class study and a final examination given at the end of each half-year. Students will profit by a knowledge of general history.

3 hrs., first half-year. M W F, 3. 2 hrs., second half-year. M F, 3.

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\*Not to be given, 1918-19; will be given 1919-20 and alternate years.

## 6A-6B. Elementary Design.

(NEUHAUS)

The principles that govern design. Geometrical forms as the basis of all design; the various laws of rhythm, balance, harmony, etc. Lectures, discussions and blackboard illustration; class problems in pencil, ink, and color.

4 hrs., throughout the year; 2 units each half-year. M F, 9-11. Prerequisite: course A-B, and Drawing CD.

## 7A-7B. Color Theory.

(NEUHAUS)

A theoretical study of color problems with practical application in water color, tempera, and crayons.

3 hrs., throughout the year; 1 unit each half-year. W, 1-4. Prerequisite: course A-B and Drawing CD.

## 14A-14B. Advanced Freehand Drawing.

(JUDSON)

6 hrs., throughout the year; 2 units each half-year. Two sections: I, Tu Th, 9-12; II, Tu Th, 1-4. Prerequisite: course A-B or matriculation subject 16.

## UPPER DIVISION MAJOR COURSES

## 102. Teachers' Training Course in Freehand Drawing.

(NAHL)

A presentation of freehand drawing for students preparing to teach. Relation of drawing to other subjects, methods of teaching and selection of materials.

1 hr., second half-year; 1 unit. M, 4. Prerequisite: senior or graduate standing.

## 114A-114B. Advanced Work in Freehand Drawing.

(JUDSON)

Continuation of course 14A-14B.

6 hrs., throughout the year; 2 units each half-year. I, Tu Th, 9-12; II, Tu Th, 1-4. Prerequisite: course 14A-14B.

## 115A-115B. Drawing from Model; Composition.

(JUDSON)

3 hrs., throughout the year; 1 unit each half-year. W, 9-12. Prerequisite: course 114A-114B.

## 116A-116B. Still-life Painting.

(JUDSON)

3 hrs., throughout the year; 1 unit each half-year. M, 9-12. Prerequisite: course 114A-114B.

## 117A-117B, 117C-117D. Advanced Color Study.

(NEUHAUS)

Practical problems in all mediums except oils, applied to decorative purposes.

3 hrs., throughout two years; 1 unit each half-year. F, 1-4. Prerequisite: courses 6 and 7. Students should register for 117A-117B in the first year; 117C-117D in the second year.

- 118A-118B, 118C-118D. Advanced Design. (NEUHAUS)  
 Natural objects and their translation into conventional forms. Practical application of design in pencil and water color. Stenciling, wood-block printing.  
 3 hrs., throughout two years; 1 unit each half-year. M, 1-4. Prerequisite: courses 6 and 7. Students should register for 118A-118B in the first year; 118C-118D in the second year.
- 127A-127B. Art Anatomy. (NAHL)  
 The proportions and the general appearance of the human form.  
 1 hr., throughout the year; 1 unit each half-year. F, 4. Prerequisite: course 114A.
- 128A-128B. Art Anatomy Practice. (NAHL)  
 Drawing in charcoal from bones, anatomical casts and life models, in light and shadow, direct and foreshortened.  
 3 hrs., throughout the year; 1 unit each half-year. Th, 9-12. Prerequisite: course 127A-127B.
168. Community Art. (NEUHAUS)  
 Discussion of the aesthetic problems of community life. The promotion of artistic appreciation through the fine and applied arts. Intended to be especially helpful to prospective teachers and also to others, who are interested in the many practical and aesthetic problems in and outside of the school and home.  
 1 hr., first half-year. Tu, 8 p.m. Prerequisite: senior or graduate standing.
199. Pro-seminar in Graphic Art. (JUDSON, NEUHAUS and NAHL)  
 According to the interests and requirements of the students.  
 3-6 hrs., either half-year; 1-2 units. Hours to be arranged.

#### GRADUATE COURSES

- 216A-216B. Advanced Still-life Painting. (JUDSON)  
 Continuation of course 116A-116B.  
 3 hrs., throughout the year; 1 unit each half-year. Tu, 1-4. Prerequisite: course 116A-116B.
- 217A-217B. Continuation of course 117A-117B. (NEUHAUS)  
 Hours to be arranged.
- 218A-218B. Continuation of course 118A-118B. (NEUHAUS)  
 Hours to be arranged.
- 228A-228B. Continuation of course 128A-128B. (NAHL)  
 3 hrs., throughout the year; 1 unit each half-year. Th, 9-12.
269. Seminar in Graphic Art. (JUDSON, NEUHAUS and NAHL)  
 According to the interests and requirements of the students in the course.  
 3-6 hrs., either half-year; 1-2 units. Hours to be arranged. Prerequisite: graduate standing.

## ECONOMICS

CARL C. PLEHN, Ph.D., LL.D., Professor of Finance on the Flood Foundation.

<sup>1</sup>HENRY R. HATFIELD, Ph.D., Professor of Accounting on the Flood Foundation; Dean of the College of Commerce.

STUART DAGGETT, Ph.D., Professor of Railway Economics on the Flood Foundation.

<sup>2</sup>LINCOLN HUTCHINSON, M.A., Professor of Commerce on the Flood Foundation.

<sup>3</sup>JESSICA B. PEIXOTTO, Ph.D., Professor of Social Economics.

IRA B. CROSS, Ph.D., Associate Professor of Economics on the Flood Foundation.

LUCY W. STEBBINS, A.B., Associate Professor of Social Economy.

SOLOMON BLUM, Ph.D., Associate Professor of Economics.

WARNER BROWN, Ph.D., Assistant Professor of Psychology.

CHARLES C. STAHLING, M.S., Assistant Professor of Accounting.

<sup>4</sup>FREDERICK R. MACAULAY, LL.B., M.A., Instructor in Economics.

J. EVAN ARMSTRONG, A.B., Instructor in Stenography and Typewriting on the Flood Foundation.

ELBERT A. KINCAID, M.A., Instructor in Economics.

JOHN F. FORBES, Certified Public Accountant, Lecturer in Accounting.

VICTOR MONTGOMERY, A.B., Actuary, State Insurance Commission, Lecturer in Actuarial Science.

CAROLINE SCHLEEF, A.B., Lecturer in Housing Problems.

LOUISE MORROW, A.B., M.D., Assistant in Social Economics.

EARL D. DAVIS, M.A., Assistant in Economics.

FELIX FLÜGEL, M.A., Assistant in Economics.

CORNELIA S. PARKER, B.L., Assistant in Social Economics.

*Facilities for Graduate Study.*—The University Library is well supplied with works on economic subjects, and in particular with official statistical publications of the chief commercial countries of the world. These materials, with the official trade documents of the San Francisco Customs House, afford opportunity for the study of the trade, resources, and economic geography of particular countries and ports. The unique collection of local materials in the Bancroft Library is available for research in the economic history of the Pacific Coast. A collection of state reports and documents on public finance, complete for the last nine years, and in some instances extending over a longer period, may be consulted in the private library of Mr. Plehn.

<sup>1</sup> In residence, second half-year only.

<sup>2</sup> Absent on leave for the duration of the war.



Special facilities also exist at Berkeley for the study of economic problems at first hand. San Francisco is the banking center of the Coast; and the banking system here is peculiar because of the actual circulation of gold coin, direct Oriental and European exchange, and crop movements practically continuous throughout the year. San Francisco is also the terminus of three great railways. The distance of California from the Middle West has given great importance to questions of transportation, and rate questions are subjects of constant interest. Mention may also be made of the completeness of labor organization in some parts of California and of its absence in others, of problems of seasonal labor, of the presence of the oil fields, of irrigation plants, lumbering on a large scale, experiments in co-operation, and the like.

To those interested in social work the high level of income in San Francisco and the consequent importance of preventive or constructive charity also affords matter for investigation.

The courses prerequisite to advanced work in the Department of Economics are Economics 1A-1B and either Political Science 1A-1B, or History 1A-1B. A reading knowledge of French and German is eminently desirable, and will ordinarily be required of students in the College of Commerce or honor-students in economics.

*Honor-students in the Upper Division.*—Students in the College of Letters and Science may receive honors in economics at graduation either

1. Upon the intelligent completion of a course of reading in some general field, or,
2. Upon the basis of a thesis showing ability to do original work.

In either case, candidates for honors must prepare a programme at the beginning of their candidacy in consultation with a committee of the department appointed to supervise their work. On approval of this plan of study, the student will proceed to its completion in close co-operation with his committee, attending conferences and making such reports of progress as may be asked for. Students are advised against too narrow specialization. In most cases, the junior year will be spent in preliminary reading. In the senior year, those students who desire to take honors on the basis of reading alone will make that reading more intensive, and will prepare for a final oral examination in which their attainment will be tested; while those who desire to engage in research will prepare a thesis embodying their results.

Honor-students will be allowed much freedom in their studies. To justify this, the work which they do must be consistently of high quality. The department will recommend the exclusion from the honor-group of all students who do not maintain each half-year an average of at least sixty per cent of first and second grades in all their courses and who do not complete their courses in economics with high credit.

All senior students will enroll in course 199A-199B. Juniors, subject to the approval of the department committee on honors, will either enroll in course 198A-198B or be assigned to various courses in economics as their individual needs may require.

## LOWER DIVISION COURSES

- A. Elementary Stenography and Typewriting. (ARMSTRONG)  
 Recitations four hours a week, each recitation requiring outside preparation; and in addition four hours a week of typewriting under the instructor's supervision. Exclusively for students in the College of Commerce and for students preparing for the teaching of commercial work in the high schools. Not open to special students.  
 8 hrs., either half-year; 4 units. First half-year: M Tu Th F, 1-3; second half-year: M Tu Th F, 3-5. Fee, \$10.
- B. Intermediate Stenography and Typewriting. (ARMSTRONG)  
 8 hrs., either half-year; 4 units. First half-year: M Tu Th F, 3-5; second half-year: M Tu Th F, 1-3. Prerequisite: course A. Fee, \$10.
- 1A-1B. Principles of Economics. (PLEHN, HATFIELD, DAGGETT, CROSS, BLUM, KINCAID, PEIXOTTO, and Assistants)  
 3 hrs., throughout the year. Lecture: Tu, 9, and two periods a week of section work to be arranged. Prescribed for all students in the College of Commerce. Prerequisite: at least sophomore standing.
- 3A. Introduction to Economic Geography.  
 The relations between geography and economics.  
 3 hrs., second half-year. M W F, 8. Prerequisite: Geography 1A.
- \*3B. The Geography of International Trade.  
 The economic geography of the chief modern commercial nations.  
 3 hrs., first half-year. M W F, 8. Prerequisite: course 3A.
6. Advanced Stenography and Typewriting. (ARMSTRONG)  
 8 hrs., either half-year; 4 units. M Tu Th F, 1-3. Prerequisite: courses A and B. Fee, \$10.
- 14A-14B. Principles of Accounting. (HATFIELD and STAEHLING)  
 4 hrs., throughout the year; 3 units each half-year. Recitation, Tu Th, 8. Laboratory periods, eight sections: I, W, 3-5; II, Th, 10-12; III, Th, 2-4; IV, F, 2-4; V, M, 10-12; VI, M, 1-3; VII, Tu, 10-12; VIII, Tu, 2-4. Prerequisite: at least sophomore standing. Students enrolling in this course may take an extra laboratory period each half-year with one additional unit credit.

## UPPER DIVISION MAJOR COURSES

*Theory*

100. Economic Theory.  
 An intermediate course in theory.  
 3 hrs., first half-year. M W F, 10. Prerequisite: course 1A-1B.
- 101A-101B. History of Economic Thought. (BLUM)  
 A review of economic thought from Adam Smith to the modern economists.  
 2 hrs., throughout the year. Tu Th, 8. Prerequisite: course 1A-1B.

- \*102. Classical Economists. (MACAULAY)  
A critical and historical study of the English classical school.  
2 hrs., first half-year. Tu Th, 8. Prerequisite: course 1A-1B.
- \*103. Types of Economic Theory. (MACAULAY)  
A critical examination of some of the leading types of economic theory since 1870.  
2 hrs., second half-year. Tu Th, 10. Prerequisite: course 1A-1B.
- \*104. Economic Cycles. (MACAULAY)  
An analytic study of the economic phenomena of business prosperity, crisis, depression and revival. A critical examination of some of the more important modern theories.  
2 hrs., second half-year. M W, 11. Prerequisite: course 1A-1B.
- \*105. Advanced Economics.  
An introduction to modern mathematical and statistical economic theory.  
2 hrs., second half-year. Hours to be arranged. Prerequisite: course 1A-1B.
- \*106. Contemporary Theories of Social Reform. (PEIXOTTO)  
The principles and programmes of the leading reform movements of the day which aim at the partial or total reconstruction of industrial society, with some historical review of these movements.  
3 hrs., first half-year. M W F, 3. Prerequisite: course 1A-1B and at least junior standing.
- \*109A-109B. Economic Environment and the Social Sciences. (BLUM)  
A discussion of the relationships between economic environment and law, economics, political science, and other social sciences.  
2 hrs., throughout the year. Tu Th, 8. Prerequisite: course 1A-1B; open to seniors and graduate students.

*Economic History*

110. Economic and Commercial History. (CROSS)  
A general survey of some of the most important events in the economic history of Europe.  
3 hrs., first half-year. M W F, 9. Prescribed for students in the College of Commerce.
111. Industrial History of the United States. (DAGGETT)  
A broad discussion of economic conditions in the United States from 1789 to 1915.  
3 hrs., second half-year. M W F, 9.

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\*Not to be given, 1918-19.

**\*112. Modern Industrialism.**

(CROSS)

The rise and development of the modern industrial system with special reference to the workings of competition; the trust problem.

3 hrs., second half-year. M W F, 9. Prerequisite: course 1A-1B.

*Business Organization and Management***120. Business Organization and Administration.**

A survey of the problems which arise in production, sale, and distribution of the product.

3 hrs., first half-year. M W F, 8. Prerequisite: course 1A-1B.

**121. Factors of Industrial Efficiency.**

Modern competitive production; scientific management, etc.

3 hrs., first half-year. M W F, 9.

**122. Office Organization, Administration and Procedure.**

A detailed study of the problems which arise in the organization, administration, and procedure of the American office.

2 hrs., first half-year. Tu Th, 2.

**123. Markets and Marketing.**

(KINCAID)

The organization of existing markets and the methods of marketing representative California agricultural products. This course affords a foundation for work in Rural Institutions 201 (College of Agriculture).

2 hrs., second half-year. Tu Th, 9.

**125. Advertising.**

(BROWN)

The principles governing the choice of media, the frequency of appeal, the amount and nature of the matter, and the choice of methods of appeal, with emphasis upon experimental methods of measuring the effectiveness of advertising. Weekly lectures, investigations and criticism of advertisements, and one hour of conference.

2 hrs., second half-year. Lecture, Th, 7:30 p.m. Conference hours to be arranged.

**126. Agricultural Economics.**

(KINCAID)

The economic principles involved in the determination of land values, interest on the farmer's capital, wages of farm labor, and profits in agriculture; economic aspects of tenantry; price making forces in the agricultural industry; the farmer in his business relations.

3 hrs., first half-year. Tu Th 8, 11.

**127A-127B. Commercial Reviews and Trade Journals. (CROSS and —)**

Reading of current commercial and trade journals.

1 hr., throughout the year; 1 unit each half-year. W, 4. Prescribed for and open only to seniors in the College of Commerce.

129. The Teaching of Stenography and Typewriting. (ARMSTRONG)  
The scope and methods of high school instruction in stenography and typewriting.

2 hrs., first half-year. S, 8-10. Prerequisite: courses A, B.

*Finance*

130. American Financial Policy. (PLEHN)  
The legislation and experience of the United States touching currency, banking, debt, taxation, expenditure, etc. Special attention will be given to war finance.

3 hrs., second half-year. M W F, 1. Prerequisite: course 1A-1B.

131. Introduction to Public Finance. (PLEHN)  
The theory and methods of taxation; the expenditure and administration of public funds; public debts.

3 hrs., first half-year. M W F, 1.

- \*133. Corporation Finance. (HATFIELD)

2 hrs., first half-year. Tu Th, 3.

134. Investments. (HATFIELD)

2 hrs., second half-year. Tu Th, 3.

135. Elements of Money and Banking. (CROSS)

3 hrs., first half-year. M W F, 10.

136. Foreign Exchange. (CROSS)

3 hrs., second half-year. M W F, 9. Prerequisite: course 135.

137. Advanced Money and Banking. (CROSS)

3 hrs., second half-year. M W F, 10. Prerequisite: course 135.

- \*Economic Cycles. [See course 104.] (MACAULAY)

*Statistics and Insurance*

140. Elementary Statistics.

An introduction to statistical method. A knowledge of higher mathematical analysis is not required.

6 hrs., first half-year, including laboratory periods; 4 units. Tu Th, 11; laboratory periods to be arranged.

- \*141. Statistics in the Service of Business. (MACAULAY)

3 hrs., first half-year, including one laboratory period. M W, 11, and a laboratory period to be arranged. Prerequisite: course 140. Class to be limited at the discretion of the instructor.

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\*Not to be given, 1918-19.

**\*142. Advanced Statistics.****(MACAULAY)**

Probability, the theory of error, and the foundations of statistical theory; non-linear regression; multiple correlation.

2 hrs., second half-year. Tu Th, 11. The consent of the instructor must be obtained before enrollment.

**143A-153B. Economics of Insurance.****(MONTGOMERY)**

An elementary course in the principles of insurance. Mathematical treatment will be avoided, so far as possible.

2 hrs., throughout the year. Tu Th, 8.

**144. Life Insurance.****(———)**

History of life insurance; forms of company organization and management; surplus; taxation. Mathematical treatment will be avoided.

3 hrs., second half-year. M W F, 9. Prerequisite: course 143.

**145. Property Insurance****(———)**

Fire, marine, burglary, automobile, plate glass, boiler, fly-wheel, etc.

2 hrs., first half-year. Tu Th, 9. Prerequisite: course 143.

**146. Social Insurance.****(———)**

Health, unemployment, workmen's compensation, industrial and old age insurance.

3 hrs., second half-year. M W F, 10.

**147. Special Problems in Social Insurance.****(———)**

2 hrs., first half-year, hours to be arranged. Limited to a small number of students whose records indicate ability to do advanced work. The consent of the instructor must be obtained before enrollment.

**148A-148B. Actuarial Science.****(MONTGOMERY)**

The mathematical theory of insurance.

3 hrs., throughout the year. M W F, 8. The consent of the instructor must be obtained before enrollment.

NOTE.—Students who wish to prepare themselves for actuarial work should confer with the instructor concerning the best choice of their mathematical courses.

***Labor*****150. Labor Problems.****(BLUM)**

The history and problems of the labor movement, and the development of labor legislation.

3 hrs., first half-year. M W F, 8.

**151. Labor Organizations.****(BLUM)**

The history, structure, and activities of labor organizations.

3 hrs., second half-year. M W F, 8. Prerequisite: course 150 is desirable but not required.

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\*Not to be given, 1918-19.

*Accounting*

- \*160. Accounting Systems. (HATFIELD)  
Principles of accounting as applied to different forms of enterprise.  
3 hrs., first half-year. M W F, 8. Prerequisite: course 14A-14B.
161. Cost Accounting. (FORBES)  
4 hrs., second half-year; 2 units. W, 7:30-9:30 p.m. and one laboratory period to be arranged. Open to advanced students on consent of instructor.
162. Auditing. (FORBES)  
Open only to students who have completed course 14A-14B or who give other evidence of competency.  
2 hrs., first half-year. W, 7:30-9:30 p.m.
- †163A-163B. Advanced Accounting Problems. (HATFIELD)  
Investigation and reports on suggested topics.  
2 hrs., throughout the year. Tu Th, 10. Class to be limited at the discretion of the instructor.
- \*164A-164B. Public Utility Accounts. (FORBES)  
1 hr., throughout the year. Th, 8. Prerequisite: course 14A-14B.
- 165A-165B. Municipal Accounts. (FORBES)  
1 hr., throughout the year. Th, 8. Prerequisite: course 14A-14B.
166. Teachers' Course. (HATFIELD)  
The scope and methods of teaching bookkeeping and allied subjects in the high school.  
2 hrs., second half-year. Hours to be arranged. Prerequisite: a knowledge of bookkeeping.
167. Partnership Accounting. (STAEHLING)  
2 hrs., first half-year. M W, 11. Prerequisite: course 14A-14B.
- \*168. Fiduciary Accounting. (STAEHLING)  
2 hrs., second half-year. Tu Th, 8. Prerequisite: course 14A-14B.
169. Income Tax Accounting. (STAEHLING)  
2 hrs., second half-year. Tu Th, 8. Prerequisite: course 14A-14B.

*Transportation and Foreign Trade*

- \*170A-170B. The Statistics of International Trade. (HUTCHINSON)  
2 hrs., throughout the year. Tu Th, 2. Prerequisite: at least junior standing and a reading knowledge of some modern European language other than English. The consent of the instructor must be obtained before enrollment.

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\*Not to be given, 1918-19.

† Not to be given first half-year.

- \*171. Economic Geography of South America. (HUTCHINSON)  
2 hrs., second half-year. Tu Th, 9. Prerequisite: course 3A.
173. Railway Economics. (DAGGETT)  
A general discussion of railway history, rates, finances, and regulation.  
3 hrs., first half-year. M W F, 2. Prerequisite: course 1A-1B.
174. Railway Traffic. (DAGGETT)  
Railway organization, forms, accounts, rates and rate construction.  
3 hrs., second half-year. M W F, 3. Prerequisite: course 173.
- \*175. Railroad Regulation. (DAGGETT)  
Mainly concerned with the Interstate Commerce Act.  
3 hrs., second half-year. M W F, 2. Prerequisite: course 173.
176. The History of Railroads in California. (DAGGETT)  
3 hrs., first half-year. M W F, 3. Prerequisite: course 173.

*Social Economics*

- \*180. The Control of Poverty. (PEIXOTTO)  
Studies of the facts and causes of poverty and of contemporary proposals for its prevention. Lectures, reports, visits to appropriate philanthropic and industrial institutions, and field work. An additional unit will be given to those who elect to take the excursions and field studies offered in connection with the course.  
3 hrs., first half-year. M W F, 2. Prerequisite: course 1A-1B; open only to seniors and to graduates.
181. Care of Dependents. (STEBBINS)  
The problems of outdoor and institutional care of the dependent and defective classes. Lectures, reports, and field work.  
3 hrs., first half-year. M W F, 2.
182. Studies in the Standard of Living. (PEIXOTTO)  
Studies in the theory and practice of spending, with special reference to household budgets.  
3 hrs., second half-year. M W F, 2.
- \*183. Crime as a Social Problem. (PEIXOTTO)  
3 hrs., second half-year. M W F, 3.  
Students interested in this subject should note courses 102 and 104 in the department of Jurisprudence.

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\*Not to be given, 1918-19.



## 188. Housing.

(SCHLEEF)

Class discussions and field work in connection with problems of housing and their relation to the public welfare. A detailed investigation of local housing conditions will be undertaken by the class.

2 hrs., throughout the year. Tu, 7:30 p.m. Open only to seniors and graduates in economics. Enrollment limited.

*Honor-Courses*

## 198A-198B. Honor-Course for Juniors.

(The STAFF)

Throughout the year. Hours to be arranged.

## 199A-199B. Honor-Course for Seniors.

(The STAFF)

Throughout the year. Hours to be arranged.

## GRADUATE COURSES

Graduate students are also referred to "Upper Division Major Courses" listed in the preceding pages.

## 201A-201B. Conference in Economics.

(PLEHN and Members of the Department)

Under this head are included arrangements for the guidance of the work of graduate students in the preparation of theses for higher degrees. Subjects may be chosen in the following fields: accounting (HATFIELD); economic theory and statistics (MACAULAY); foreign trade (HUTCHINSON); money, banking, and foreign exchange (CROSS); public finance (PLEHN); social economics (PEIXOTTO and STEBBINS); stenography (ARMSTRONG); transportation (DAGGETT); labor (BLUM). The results will be presented to the seminar for discussion as occasion may suggest.

2 hrs., throughout the year. Alternate W, 7:30 p.m.

## 202. Advanced Studies in Social Economics.

(PEIXOTTO)

Research in problems of social economics.

3 hrs., second half-year. Alternate M, 7:30-9:30 p.m., and additional hours to be arranged.

## 203. Advanced Studies in Social Economics. (PEIXOTTO and MORROW)

Field work in connection with course 202A-202B. Students give three half-days weekly as volunteer members of staff in the offices of state commissions, private charities, juvenile courts, or kindred agencies, or carry on some social study under direction.

3 hrs., second half-year. Hours to be arranged.

## 204A-204B. Government Finance.

(PLEHN)

War finance of the nations involved in the great war.

2 hrs., throughout the year. M, 3-5. Prerequisite: course 131.

205A-205B. Labor Legislation and the Labor Movement on the Pacific Coast. (BLUM)

2 hrs., throughout the year. Hours to be arranged. Prerequisite: either course 150 or 151.

#### COURSES IN OTHER DEPARTMENTS

Social Psychology. [See Philosophy 145.]

Philosophies of Social Relations. [See Philosophy 45A-45B.]

Co-operation in Marketing. [See Rural Institutions 201.]

Rural Credits and Land Settlement. [See Rural Institutions 202.]

Fundamentals of Modern Geography. [See Geography 1A.]

Geography of the Americas. [See Geography 116A.]

Geography of Europe. [See Geography 116C.]

Commerce and Industry of Japan. [See Oriental Languages 121A-121B.]

Criminology. [See Jurisprudence 102.]

Juvenile Delinquency. [See Jurisprudence 104.]

## EDUCATION

ALEXIS F. LANGE, Ph.D., Professor of the Theory and Practice of Education and Director of the School of Education.

RICHARD G. BOONE, Ph.D., Professor of Education.

\*IRA W. HOWERTH, Ph.D., Professor of Education.

CHARLES E. RUGH, M.L., Professor of Education.

WILLIAM W. KEMP, Ph.D., Professor of School Administration.

ROBERT J. LEONARD, M.A., Professor of Vocational Education.

CYRUS D. MEAD, Ph.D., Associate Professor of Elementary Education.

W. SCOTT THOMAS, A.B., Assistant Professor of Education and Examiner of Schools.

JOHN S. BOLIN, M.A., Instructor in Education.

Undergraduate and graduate courses are offered which may serve non-professional as well as professional purposes. It is believed that such courses provide instruction which is desirable for individual culture and training and as preparation for that intelligent participation in public and private education which good citizenship demands of educated men and women.

The courses properly preliminary to advanced work in the Department of Education are Philosophy 1 (Logic), or Zoology 1, or Physiology 1, or Political Science 1A or 1B, or Economics 1A-1B; Philosophy 2A (Psychology), and Philosophy 104A-104B (Ethics) or an equivalent course. The course in ethics may, however, be taken concurrently with major courses in education. A student in the upper division who offers major courses in education in satisfaction of the minimum of 12 units required to be taken for the A.B. degree in major courses of a single department must normally elect Education 105A and 116, and may include one of the following courses: Jurisprudence 109 (School Legislation of California), Economics 106 (Contemporary Theories of Social Reform), Hygiene 101 (Child Hygiene), and Zoology 104 (Animal Behavior).

Special provision is made for the professional training of teachers of three classes:

A. Those preparing to become teachers in secondary schools or in colleges.

For the conditions under which recommendations for Teachers' Certificates of the high school grade are issued, see Announcement of the School of Education. For the year 1918-19 the 15 units for professional requirements must include one course from each of the following groups:

- I. HISTORY OF EDUCATION. Either 103B, 3 units, or 125, 3 units.
- II. THEORY OF EDUCATION. Either 105B, 2 or 3 units; or 107, 2 units; or 121, 3 units; or 226, 2 units.
- III. THEORY AND METHOD OF SCHOOL PRACTICE. 223, 1 unit.
- IV. PRACTICE TEACHING. 201, 4 units.

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\* Absent on leave, 1918-19.

In addition "a teacher's course in at least one subject, if such course be given in the institution and be accepted by or listed under the work in education, a maximum of three units for all such courses."

It is very desirable that Philosophy 2A (Psychology), or an equivalent course be taken as preliminary to these courses or as a companion course with one or more of them. Students who have not had such preparation must, before being admitted to a required course, pass an examination in this subject in case they desire to qualify for the recommendation for the High School Teacher's Certificate. Students are expected to distribute the work over their senior and graduate years.

B. Those preparing to engage in school administration, to become principals or superintendents of public schools, or to teach in normal schools or in college departments of education.

C. Graduates of normal schools, who are making further preparation for teaching in elementary schools.

Special courses will be arranged to meet the needs of individual students.

### FREE ELECTIVE COURSE

#### 11. Education and Culture.

(BOLIN)

Stereopticon lectures on the evolution of educational thought and practice.

1 hr., first half-year. M, 4.

### UPPER DIVISION MAJOR COURSES

#### *History of Education*

#### 103A. The History of Education: Earlier Periods.

(BOLIN)

The development of educational thought and practice up to the close of the medieval period.

3 hrs., second half-year, to be arranged.

#### 103B. The History of Education: Later Periods.

(KEMP and BOLIN)

The development of educational thought and practice from the Renaissance to the present, viewed as a phase of social progress.

3 hrs., either half-year. Three sections: I, M W F, 8; II, M W F, 3; III, M W F, 10.

#### 125A. The History of American Education.

(BOONE and BOLIN)

An historical study of the leading ideas and ideals of American education and of the institutions in which they have been embodied.

3 hrs., either half-year. Three sections: I, M W F, 8; II, M W F, 2; III, Tu Th S, 8.

#### 125B. The History of Elementary Education.

(MEAD)

3 hrs., first half-year. M W F, 10.

*Educational Psychology*

110. The Psychological Basis of Secondary Education. (BOONE)  
 An investigation into the processes and methods of learning and of teaching from the point of view of the psychology of adolescence.  
 3 hrs., first half-year. M W F, 10.
111. Social Psychology. (BOONE)  
 A study of the evolution and functioning of the social mind, with special reference to education.  
 2 hrs., second half-year. Tu Th, 2.

*Theory of Education*

- \*104A. The Biological Principles of Education. (HOWERTH)  
 The biological foundations of educational theory. The principles and practices of formal education as based upon and derived from the methods of nature in the development of plants, animals, and man.  
 3 hrs., first half-year. M W F, 2.
- \*104B. The Sociological Principles of Education. (HOWERTH)  
 A study of the evolution of society and of social institutions, with particular reference to the relation of formal education to the progress of society.  
 3 hrs., second half-year. M W F, 2.
- 105A. The Theory of Education. (LANGE)  
 A study of fundamental principles, processes, and methods, with special reference to national culture and ideals.  
 3 hrs., first half-year. Two sections: I, M W F, 8; II, M W F, 9.
- 105B. The Principles of Secondary Education. (LANGE and BOONE)  
 A study of the theoretical and the broader practical aspects of the secondary stage of education, with special reference to the American high school system.  
 2 hrs., either half-year. Two sections: I, M W, 9; II, M W, 11. (BOONE)  
 3 hrs., second half-year. Section III, M W F, 9. (LANGE)
121. The High School. (THOMAS)  
 A study of the concrete problems of the high school, with reference to questions of aims, curriculum, instruction, and management.  
 3 hrs., first half-year. Two sections, M W F, 2 and 3.
- 126A-126B. Elementary Education. (MEAD)  
 A course for supervisors, principals, and teachers in the elementary schools, or, for those preparing for elementary school service.  
 3 hrs., throughout the year. M W F, 9.
127. Moral Education. (RUGH)  
 The moral life as a personal response to the social order. The school as a means of moral education.  
 2 hrs., second half-year. Tu Th, 8.

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\* Not to be given, 1918-19.

128. Problems of Moral Education. (RUGH)  
Special study of training for citizenship in a democracy.  
2 hrs., either half-year, hours to be arranged. Admission only on consultation with the instructor.

*School Organization and Administration*

106. School Systems. (THOMAS)  
The development and present status of typical European systems of education, particularly those of Germany, France, and England.  
3 hrs., first half-year. Tu Th, 10; S, 8.
107. The Administration of Public Education. (KEMP)  
2 hrs., either half-year. M W, 3.
- 108A. Contemporary Movements in Education. (KEMP)  
A survey of educational discussion and practice touching on urgent administrative problems of the day. The course is designed primarily for advanced students with teaching experience who desire to prepare for the administrative side of school work.  
2 hrs., first half-year. Th, 7:30-9:30 p.m. Prerequisite: course 107 or teaching and administrative experience.
- 108B-108C. Modern Methods in Elementary Instruction. (MEAD)  
A course primarily for teachers in service. The first half-year will cover the work of the first six years of the elementary school; the second half-year, the intermediate school years.  
2 hrs., throughout the year. S, 10-12.
109. Problems in the Administration and Supervision of Schools. (KEMP)  
Designed primarily for advanced students with teaching experience who desire to prepare for the administrative side of school work.  
2 hrs., second half-year. Th, 7:30-9:30 p.m. Prerequisite: course 107 or teaching and administrative experience.
112. The Intermediate (Junior High) School. (MEAD)  
The development of the movement and the specialization of work for the intermediate school.  
2 hrs., second half-year. M W, 11.
- \*114. The American University-College. (LANGE)  
The evolution, character, and function of the American university as an organ of the body politic; its organization in the light of its inherent purposes; curricula and instruction; the meaning of academic citizenship; relation of student activities to university aims; progressive policies; the Junior College movement. Lectures, discussions, debates.  
2 hrs., first half-year.

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\*Not to be given, 1918-19.

116. Pro-seminar: Selected Topics in the Theory and Practice of Secondary Education. (BOONE and KEMP)  
2 hrs., either half-year, to be arranged. Prerequisite: at least two of the preceding courses. Admission only on consultation with the instructor.

*Vocational Education*

115. Introduction to Research in Vocational Education. (LEONARD)  
Review of occupational studies and vocational surveys giving critical attention to methods employed and organization and interpretation of data. Special study.  
2 hrs., first half-year. Tu Th, 3.
119. Vocational Education. (LEONARD)  
The history, meaning, and organization of vocational education; state and federal legislation, including the Smith-Hughes act; development of state systems and principles underlying education for industry, commerce, agriculture, women's occupations, and home economics.  
3 hrs., throughout the year. M W F, 8.
120. Problems in Vocational Education. (LEONARD)  
Consideration of special problems including legislation, part-time and continuation schools, evening schools, and the organization of courses of study for industrial, commercial, agricultural, and household occupations.  
2 hrs., throughout the year. Tu Th, 4.

## GRADUATE COURSES

## RESEARCH COURSES

207. Educational Seminar. (LANGE)  
Topics change from year to year. Admission only on consultation with the instructor.  
2 hrs., throughout the year. M, 7:30-9:30 p.m.
208. Public Administration of School Systems. Seminar. (KEMP)  
2 hrs., throughout the year. M, 7:30-9:30 p.m. (Admission only on consultation with the instructor.)
209. Seminar in Vocational Education. (LEONARD)  
Admission only on consultation with the instructor.  
2 hrs., throughout the year. W, 4-6.

**\*210. Society and Education.****(HOWERTH)**

Social phases of education, including an intensive study of one or more of the great treatises on the subject of education from the social viewpoint. The particular author to be studied will be selected after consultation with the class.

2 hrs., throughout the year. Th, 4-6.

**\*211. School Organization.****(LANGE)**

The parts of the state school system and their articulation, with special reference to secondary education in California. Admission on consultation with instructor.

2 hrs., second half-year.

**212. Research Method in Education.****(LANGE)**

Principles and processes of interpretation and explanation; types and criteria of procedure; adequate exposition; the scientific monograph. The emphasis of the course falls on training in scholarly application.

2 hrs., second half-year. Th, 7:30-9:30 p.m. Admission on consultation with the instructor.

**214A-214B. Measurement of Elementary School Work.****(MEAD)**

For teachers, supervisors, principals, and superintendents who wish to learn the elements and technique of present day testing of materials, methods, and class products, with the application of the same to the improvement of instruction.

2 hrs., throughout the year. Tu, 4-6.

**215. Special Studies.****(The STAFF)**

This course offers an opportunity for individual and for group study of the seminar type. During the past three years several groups have been at work, one on vocational guidance, another on vocational opportunities for college women, a third on the intermediate school, and a fourth on school legislation. These are likely to be continued. Suggested for group study; educational surveys, educational research bureaus, experiments in the elementary field, organization of vocational training, rural life and education, social centers, supplementary educational agencies.

Hours to be arranged.

**PROFESSIONAL COURSES****\*218. Language and Literature in Secondary Schools.****(LANGE)**

Language and literature as educational means; principles, material, and methods of instruction; the arts of interpretation and translation; practical exercises, oral and written.

3 hrs., first half-year. M W F, 10.

\*Not to be given, 1918-19.



226. Introduction to Educational Method. (RUGH)  
The school subjects, their nature and subdivisions into lessons; the nature, place, and assignment of the lesson; the recitation; principles of explanation applied to high school subjects.  
2 hrs., first half-year. Tu Th, 3.
222. Principles of Study and Presentation. (THOMAS)  
A consideration of the psychological fundamentals of study and its directions; typical processes in their relation to educational theory.  
2 hrs., first half-year. S, 9-11.
223. School Management. (RUGH)  
1 hr., either half-year. Th, 4.
201. The Practice of Teaching. (RUGH and BOLIN)  
Lectures, readings, and conferences, together with school observation and practice of teaching, under the direction of the instructor. The school observation and practice teaching ordinarily require one period daily for five days a week, but students are expected to have two consecutive free hours between 9 and 3 o'clock throughout the week in order to facilitate making the teaching assignments. Required of all candidates for the Teacher's Recommendation whose pedagogical training is taken at this University.  
4 hrs., either half-year. W F, 4; and a conference hour to be arranged. Prerequisite: I, Education 103B or 125; II, Education 105B, or 121 or 127; and III, Education 223. But the course elected under III may be taken in conjunction with this course.

#### COURSES IN OTHER DEPARTMENTS

- School Legislation in California. (See Jurisprudence 109.)  
Contemporary Theories of Social Reform. (See Economics 106.)  
Child Hygiene. (See Hygiene 101.)  
Animal Behavior. (See Zoology 104.)  
The Philosophy of Education. (See Philosophy 230.)  
Juvenile Delinquency. (See Jurisprudence 104.)  
Teachers' Courses.

## ENGLISH

CHARLES MILLS GAYLEY, Litt.D., LL.D., Professor of the English Language and Literature.

CORNELIUS B. BRADLEY, M.A., Professor of Rhetoric, Emeritus.

WALTER M. HART, Ph.D., Professor of English Philology.

CHAUNCEY W. WELLS, A.B., Associate Professor of English Composition.

BENJAMIN P. KURTZ, Ph.D., Associate Professor of English.

THOMAS F. SANFORD, A.B., Assistant Professor of English Literature.

\*HERBERT E. CORY, Ph.D., Assistant Professor of English.

HAROLD L. BRUCE, Ph.D., Assistant Professor of English Composition.

ARTHUR G. BRODEUR, Ph.D., Assistant Professor of English Philology.

ROBERT W. GORDON, M.A., Assistant Professor of English Composition.

EMMA J. BRECK, Ph.B., Lecturer in the Teaching of English.

\*LEONARD BACON, A.B., Instructor in English.

WILLIAM W. LYMAN, JR., M.A., Instructor in Celtic and English.

AUBREY BOYD, M.A., Instructor in English.

GUY MONTGOMERY, M.A., Instructor in English.

WILLIAM CHISLETT, JR., Ph.D., Instructor in English.

ADOLPH E. ANDERSON, A.B., Instructor in English.

CHARLES H. RAYMOND, A.B., Instructor in Business English.

LAURENCE SEYMOUR, A.B., Instructor in English.

IOLA G. RIESS, A.B., Chief Assistant in English.

FLORENCE BANKS, A.B., Teaching Fellow in English.

## INFORMATION FOR LOWER DIVISION STUDENTS

*Prescribed and Prerequisite Courses.*—Regular students who undertake the work of this department must have credit for entrance English 1 or 14. Applicants for special status who intend to take courses in the department of English may be required to pass the regular matriculation examinations at the usual time and place. Such applicants should consult the secretary of the department by letter, or personally, concerning the preliminary reading or formal entrance examinations to be required of them.

Course 1A-1B, or Public Speaking 1A-1B, fulfills the prescription for all colleges and curricula; and one or the other must be taken by all students who choose the group elective in English. Students desiring to engage in systematic study in the upper division are also required to take one of these courses, and must add to it one of the lower division

\* Absent on leave, 1918-19; \* for the duration of the war.

year-courses 2, 3. If desired, such course may be taken at the same time as course 1. Courses 1c and 1b are specially designed to meet the needs of students in the colleges of applied science and commerce. The attention of foreign students is called to course 1E.

*Elective Courses.*—Courses 3A-3B, 4G-4H are open to all students, without prerequisite.

### INFORMATION FOR UPPER DIVISION STUDENTS

*Elective Courses.*—The courses listed as major courses are open as electives to students in the upper division who have had the prerequisites specified in each case. When no prerequisites are specified the courses are open to upper division students who have passed in course 1A-1B, or Public Speaking 1A-1B.

*Systematic Study.*—Students who wish to undertake systematic study in the upper division must have completed English 1A-1B, or Public Speaking 1A-1B, and one of the year courses 2, 3, 17. The 12 units of major courses which by university regulation must be chosen from one department, may be made up from any upper division major courses. But all who desire to engage in comprehensive and thorough study, whether for general or professional purposes, should meet the following conditions:

1. Students must present, ordinarily in the first term of the junior year, a programme to be examined and approved by the department. The programme, however, may be amended from time to time after consultation with the department.

2. The programme should cover 24 units of upper division major courses.

3. Of the 24 units, 12 must be in one special field or subject, as for example, Early English, the Drama, Fiction and Essay, Elizabethan Poetry and Prose (inclusive of the Bible), Romantic Movement and Nineteenth Century Poetry and Prose, or the literature of any significant period or movement; or the Theory of Poetry in combination with any field in modern literature.

4. Of the 24 units, 3 must be in a pro-seminar. These may or may not be included in the 12 in the special field.

5. Normally the courses constituting the 24 units should be drawn from the list of courses in English, supplemented by the list of major courses in public speaking; but the department may be willing in exceptional cases to accept, on petition, units from other departments. For example, a student who specializes in fiction might offer certain courses in French or Russian fiction; in the drama, courses in Greek or Latin or French or German drama, etc. Under this head attention is called to Linguistics 140A (Phonetics) and German 210A-210B (English Influences upon German Literature). The 12 units in the special field and the pro-seminar must, however, be in English.

6. The student must pass, at the end of the senior year, English Final Examination No. II (History of the Literature); he must also pass English Final I (History of the Language), unless he has had either (a) 6 units from courses 110-111, or (b) 12 units in Latin or Greek or both, of university grade, or (c) at least 6 upper division units in one of the following subjects: political science, economics, history, philosophy.

7. At the end of the senior year the student must present, as evidence of powers of research and expression, a thesis written in connection with one of his courses, usually the pro-seminar.

*Honor-students in the Upper Division.*—A student in the upper division who has received honorable mention with the junior certificate may be registered as a candidate for honors provided 12 of the 48 hours on which the honorable mention was based consist of English 1A-1B, or Public Speaking 1A-1B, and one of the year courses 2, 3. To maintain his status he must do at least thoroughly satisfactory work in all of the upper division English courses in which he enrolls. No special honor-courses are at present offered by this department, but in certain major courses students who are candidates for honors in English may arrange with the instructor for additional credit, the amount of which will be determined by the instructor after he has outlined with the student the additional work to be done. The assignment, which should be entered on the student's study-card as English 199, will involve not additional class exercises but occasional conferences with the instructor. To be recommended by the department for honors with the bachelor's degree a student must complete with distinction (i.e., with the majority of units in the first grade) all the seven conditions numbered above.

#### TEACHERS' RECOMMENDATIONS AND HIGHER DEGREES

The department of English issues a separate announcement which contains its requirements for recommendation for the teachers' certificate, and for the degrees of Master of Arts and Doctor of Philosophy.

#### LOWER DIVISION COURSES

##### 1A-1B. Exercises in the Art of Discourse.

(KURTZ [in charge], BRUCE, GORDON, LYMAN, BOYD, MONTGOMERY, CHISLETT, ANDERSON, RAYMOND, SEYMOUR, and RIESS)

Speaking and writing based upon prose models of the various forms of discourse. Course 1A-1B, or Public Speaking 1A-1B, must precede the group elective in English.

3 hrs., throughout the year. Twenty-five sections. M W F, 8, 9, 10, 1, 2, 3; Tu Th S, 8, 9. Also 1B (first half-year), M W F, 10, 1, and 3; 1A (second half-year), M W F, 8, 9, 10, 1, 2, 3, and Tu Th S, 8.

##### 1C. Business English.

(RAYMOND)

A course of training adapted to the needs of students in the colleges of applied science and commerce. Students who have taken 1A-1B will not be admitted to this course, but students may proceed from 1C to 1A-1B. Enrollment limited to fifteen in a section.

3 hrs., either half-year. Two sections: I, M W F, 8; II, hours to be determined after consultation with students.

- 1D. Business English; Advanced Course. (RAYMOND)  
Enrollment limited to fifteen.  
3 hrs., either half-year. M W F, 9, or at other hours to be arranged.
- 1E. Oral and Written English for Foreigners. (SEYMOUR)  
Training in speaking and writing English. Special attention will be paid to pronunciation, grammatical construction, and the idiom of the language. To enter this course students must first obtain the consent of the instructor. Enrollment limited to twenty.  
3 hrs., second half-year. M W F, 9.
- 2A-2B. History of English Literature. (GORDON)  
For scope of lectures see course 102A-102B.  
3 hrs., throughout the year. M W F, 8. Preceptorial sections, 1 hour a week to be arranged.
- \*16A-16B. The Bible in English Literature. (GAYLEY)  
For scope of lectures see course 116A-116B.  
3 hrs., throughout the year. M W F, 2.
- 17C-17D. Shakespeare. (HART)  
For scope of lectures see course 117C-117D.  
3 hrs., throughout the year. M W F, 10.

## FREE ELECTIVE COURSES

- 3A-3B. Introduction to the Study of Poetry. (KURTZ)  
This course is designed to afford an historical perspective of European poetry and an introduction to the principles of criticism. It is offered both for those who desire a general acquaintance with poetry and for those who intend to select a European literature as a major. Lectures, reading of masterpieces in translation, frequent examinations.  
3 hrs., throughout the year. M W F, 1.
- 4G-4H. Books about the War (formerly Great Books). (GAYLEY and a Reader)  
Lectures, reading, and reports. The course is given in series, each of which may be taken once.  
1 hr., throughout the year. F, 4. Open to all students.

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\* To be given, 1919-20.

- 6B. Introduction to Narrative Writing. (WELLS and GORDON)  
Practice in the simpler forms of description and of personal and impersonal narration; analysis of masterpieces. Enrollment limited to fifteen in a section.
- 3 hrs., either half-year. First half-year, two sections. Wells (Sec. I), Gordon (Sec. II), Tu Th, 3 and a third hour; second half-year, (—), M W F, 2; Wells, Tu Th, 2 and a third hour. Prerequisite: course 1 and the consent of the instructor.
- \*7A. Advanced Exposition, Oral and Written. (KURTZ)  
Continuation of Course 1A-1B; preparation of theses with special reference to the methods of logical analysis and arrangement. Enrollment limited to fifteen.
- 3 hrs., first half-year. M W F, 10. Prerequisite: at least second grade in Course 1A-1B.
- \*10E. English Verse. (BACON)  
The history and technique of one or more of the principal kinds, with frequent practice in composition.
- 3 hrs., either half-year. Tu Th, 2, and a third hour by arrangement. Open only to students who have the permission of the instructor. Primarily for students in the upper division.
- Public Speaking.  
Students are urgently advised to take one or more of the following courses in the department of Public Speaking: 5A-5B, Second Year Public Speaking; 107A-107B, Reading and Speaking; 114A-114B, Vocal Interpretation.
- Greek Drama.  
Course 155, listed under this name in the announcement of the department of Greek, is warmly recommended to students of English drama.

#### UPPER DIVISION MAJOR COURSES

##### *Composition, Oral and Written*

- \*105B. Fundamentals of Critical Writing. (—)  
The more important critical principles in their application to standard English poetry and prose. In 1919 special study of three selected poets and two selected dramatists.
- 3 hrs., second half-year. Tu Th, 3, and a third hour to be arranged.
- 106B. Frequent Writing. (WELLS, BRUCE, BOYD)  
For at least six weeks daily one-page exercises; discussions of style; appointments for individual criticism.
- 3 hrs., either half-year. First half-year, two sections: Tu Th, 3, and a third hour; M W F, 3; second half-year, Tu Th, 3, and a third hour. Limited to fifteen in a section.

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\* To be given, 1919-20.

## 106E-106F. The Essay.

(WELLS)

- (E). Training in advanced exposition, oral and written; fortnightly compositions, with frequent *précis* and short articles. Class-study of a topic of present-day interest as a basis for writing. In 1914-15, Journalism; in 1915-16, the Present-Day Theatre; in 1916-17, the American College; in 1918-19, American Traits. Limited to twenty-four students. Prerequisite: course 7A or 105B or an equivalent.
- (F) Essays on the men and manners of a literary period. Pro-seminar. Composition, oral and written, based on a survey of the historical, social and personal background of literature as seen in the diaries, in the social history and in the standard prose and verse of the period selected. In 1918-19, the Elizabethan Age, or the times of Queen Anne, or the Victorian Era.
- 3 hrs., throughout the year. M W F, 3. Prerequisite: course 7A or 105B or an equivalent. Limited to twenty-four.

## 106H. Advanced Frequent Writing.

(BRUCE)

- A continuation of English 106B. Limited to those students who have the consent of the instructor.
- 3 hrs., first half-year. Hours to be arranged.

## 106J. Dramatic Composition.

(BOYD)

- Practice in shaping and developing a modern play. One complete drama to be submitted by each student. Limited to twelve students who have the consent of the instructor.
- 3 hrs., second half-year. M W F, 3.

## 107. Composition for Teachers.

(WELLS)

- Review of the four forms of discourse in turn, with practice in each. Studies in structure and in prose style: special emphasis on argument and on exposition as a means of teaching high school subjects other than English. Prerequisite: senior or graduate standing and the consent of the instructor. Limited to twenty.
- 3 hrs., first half-year. M W F, 4.

## 108B. Criticism of Themes.

(KURTZ)

- Practice in correcting students' themes; study of grammatical, logical, rhetorical standards, and of questions of usage; original composition; intended especially for prospective teachers and readers in college and high school English courses.
- 3 hrs., second half-year. M W F, 2.

*Principles of Literature: Interpretation and Criticism*

## 109C-109D. Problems of Literary Criticism.

(KURTZ, MONTGOMERY)

- Pro-seminar. The beginnings of poetry: analysis and classification.
- 3 hrs., throughout the year. M W F, 9.

**\*110C-110D. Literary Values.**

(CORY)

(c). Pro-seminar. Reading and reports. The philosophical and scientific implications of criticism.

(d). Pro-seminar. Thesis writing on the basis of the materials of course 110C.

3 hrs., throughout the year. M W F, 10.

*History of the Language*

Course 110A-110B, as a general survey, is recommended to all serious students of literature. It is also especially adapted to the needs of prospective teachers. Courses 111A, 111B, 111C, and 111D form a sequence dealing with the language and literature down to 1400. Although the work in these courses is, of necessity, largely linguistic, it is concerned also with the literature as such, and aims to study the masterpieces read as literary types and in connection with the life of the times that produced them. Throughout the sequence there is progressive training in the methods of literary and linguistic research. Courses 212A and 212B aim to give a general survey of the origin and growth of the language as a basis for an understanding of its present condition.

**110A-110B. General Introduction to English Philology.** (BRODEUR)

(A). The foundations of English; the literary and linguistic expression of Anglo-Saxon customs and beliefs.

(B). The Norman domination and resurgence of native manners and speech. English from the Conquest to the present day. The evolution of forms, sounds, and meanings.

3 hrs., throughout the year. M W F, 8. Prerequisite: some acquaintance with Latin or German.

**111A. Old English.**

(BRODEUR)

3 hrs., first half-year. M W F, 9.

**111B. Middle English.**

(BRODEUR)

Pro-seminar.

3 hrs., second half-year. M W F, 9. Prerequisite: course 111A.

**\*111D. Middle English: Chaucer and his Contemporaries.**

(HART)

Pro-seminar.

3 hrs., second half-year. M W F, 9.

*Historical and Critical Study of the Literature***102A-102B. History of English Literature.**

(GORDON)

Lectures covering the principal periods, movements, and masterpieces.

Special assignments adapted to advanced students.

3 hrs., throughout the year. M W F, 8.

\* Not to be given, 1918-19.



**\*114A-114B. History of the Drama.**

(———)

Lectures and readings, with reports by the students.

(A) From the Beginnings to 1642. (B) From 1642 on.

3 hrs., throughout the year. M W F, 10. Prerequisite: courses 1 and 2. This course alternates with 114C-114D (Studies in the Drama).

**\*114C-114D. Studies in the Drama.**

(———)

(C) The Renaissance of the English Drama. Lectures, readings and discussions.

(D) Dramatic Construction: analysis of masterpieces, and application of principles to dramas written by students.

3 hrs., throughout the year. M W F, 10. 114C is prerequisite to 114D.

**115A. Elizabethan Poetry.**

(SANFORD)

The principal poets from Surrey and Wyatt to Dryden; their literary forms, types, sources, and historical development. Lectures, reports, and assigned reading.

3 hrs., first half-year. M W F, 10. Prerequisite: courses 1 and 2, or their equivalent.

**115B. Spenser.**

(SANFORD)

Pro-seminar. Intensive study of the complete works of Spenser with incidental reference to his Classical and Renaissance sources. Open only to students in the upper division and to graduates.

3 hrs., second half-year. M W F, 10.

**115C. Elizabethan Prose.**

(SANFORD)

Pro-seminar. Intensive study of selected major prose writers of the 16th and 17th centuries, from Lyly to Dryden. Open only to students of the upper division and to graduates.

3 hrs., second half-year. M W F, 2.

**\*116A-116B. The Bible in English Literature.** (GAYLEY and a Reader)

Literary types; qualities of thought and style; careful study of selected books. Lectures, reports, and frequent examinations.

3 hrs., throughout the year. M W F, 2.

**117C-117D. Shakespeare.**

(HART)

The reading and interpretation of the plays in the following series:

(A) *Hamlet, Richard II, The Tempest*; (B) *Lear, 1 Henry IV, Twelfth Night*; (C) *Macbeth, 2 Henry IV, All's Well*; (D) *Othello, Much Ado, Winter's Tale*.

Each series may be taken once. In 1918-19 series (C) will be given the first half-year, and series (D) the second half-year.

3 hrs., throughout the year. M W F, 10.

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\*To be given, 1919-20.

118. The Age of Milton. (CHISLETT)  
The literature of the seventeenth century, exclusive of the drama. A reading course, with lectures and frequent reports.  
3 hrs., first half-year. M W F, 3.
- \*119A. Restoration Literature. (SANFORD)  
Pro-seminar. Intensive study of the literature of the Restoration Period (1660-1700). Open only to students in the upper division and to graduates.  
3 hrs., first half-year. M W F, 10.
- 119B. Eighteenth Century Poetry. (GORDON)  
Lectures on the poets from Pope to Wordsworth. Collateral reading and reports.  
3 hrs., second half-year. M W F, 10.
- 119C. Eighteenth Century Prose. (GORDON)  
Pro-seminar. A detailed and intensive study of selected major prose authors from Swift to de Quincy. Open only to students in the upper division and to graduates.  
3 hrs., first half-year. M W F, 3.
- 121A-121B. General History of Nineteenth Century Poetry. (SANFORD)  
Lectures; reports on assigned reading.  
(A). Wordsworth to Tennyson.  
(B). Tennyson to Swinburne.  
Open only to students in the upper division and to graduates.  
3 hrs., throughout the year. M W F, 9.
- 121E-121F. Victorian Prose. (GAYLEY)  
Pro-seminar. Intensive study of selected masterpieces dealing with problems of critical, philosophical, and political thought. Topics assigned for investigation. Theses and oral discussions. Open to seniors and graduates whose major is English, and who are taking one of the instructor's major lecture courses. Also to those who take it as Oral Debates upon Literary Topics as a sequel to Public Speaking 110A-110B. Limited to twelve students in each section.  
3 hrs., throughout the year. Section I, M, 4-6, F, 4; Sec. II, W, 4-6 and F, 4 (lecture).
122. Browning. (SANFORD)  
A systematic study of the complete poetical works of Browning. Lectures and interpretations. Open only to students in the Upper Division and to graduates.  
3 hrs., first half-year. M W F, 2.

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\* To be given, 1919-20.

- 123b. Representative Essayists. (BRUCE)  
 Pro-seminar. The developing democratic theories in English life and literature from the French Revolution to the present; nineteenth century essayists in social theory.  
 3 hrs., second half-year.
- 124b. Shelley, Keats, and Tennyson. (KURTZ)  
 Pro-seminar. An intensive study of selected poems.  
 3 hrs., second half-year. M W F, 10.
- \*125A-125B. The Development of the Narrative Art. (HART)  
 Lectures. (A) The types of briefer narrative; (B) Medieval romance. Special assignments adapted to advanced students.  
 3 hrs., throughout the year. M W F, 10.
- 125c. The Novel. (WELLS)  
 Lectures on the types of prose fiction from the Saga and early romance to the present-day novel. Ten books to be read and a critique to be written on each book. May be taken both as study in literature and as practice in advanced composition.  
 3 hrs., first half-year. M W F, 2. Prerequisite: at least junior standing and the consent of the instructor.
- \*126A-126B. The Classical Influence in English Literature. (CHISLETT)  
 Lectures and assigned readings. (A) The Nineteenth Century. (B) From the Beginnings to the Nineteenth Century.  
 3 hrs., throughout the year. M W F, 3.
127. The Anglo-Celtic Poets. (LYMAN)  
 The poets of the so-called Celtic Renaissance, centering in Yeats and the modern school of Irish writers, with an investigation of their background in Old-Irish literature. Lectures, readings, and reports.  
 3 hrs., first half-year. Tu, 2; Th, 2-4.

*American Literature*

- \*130. The General History of American Literature. (———)  
 A general review, illustrated by copious reading; lectures, reports, discussions, and papers. Introductory to course 131, and to course 249 (Californian Literature).  
 3 hrs., first half-year. M W F, 9. Prerequisite: courses 1 and 2.
- \*131. American Authors. (———)  
 Pro-seminar. Each student will make an intensive study of practically all the work of one of the more important American authors, and present papers thereon for class discussion. The course may be taken as many times as a different author is studied.  
 3 hrs., second half-year. M W F, 9. Prerequisite: course 130.

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\* To be given, 1919-20.

## 132. The American Novel.

(CHISLETT)

An historical sketch of the American novel, followed by a consideration of its more recent aims and tendencies.

3 hrs., second half-year. M W F, 3. Prerequisite: course 130.

## 199. Assignments for Honors.

In certain major courses candidates for honors may arrange with the instructor to undertake supplementary work for additional credit. For particulars, see above, *Honor-students in the Upper Division*.

## GRADUATE COURSES

Graduates electing these courses must have a reading knowledge of French or German.

## \*211B. Seminar in Beowulf.

(BRODEUR)

3 hrs., second half-year. M W F, 10. Open only to candidates for higher degrees.

## 211E-211F. Seminar in Chaucer.

(HART)

3 hrs., throughout the year. Tu Th, 9-10:30. Open only to candidates for higher degrees.

## 212A. History of the English Language.

(BRODEUR)

3 hrs., first half-year. M W F, 10. Open only to candidates for higher degrees.

## \*212B. Historical English Grammar.

(BRODEUR)

3 hrs., first half-year. M W F, 10. Open only to candidates for higher degrees.

## 223B. Seminar. Representative Essayists.

(BRUCE)

3 hrs., second half-year. Hours to be arranged. Limited to candidates for the teacher's recommendation.

## 231. Philological Seminar. Middle Scottish.

(BRODEUR)

3 hrs., second half-year. M W F, 10.

## \*240A-240B. Seminar in Literary Criticism.

(GAYLEY)

From a study at first hand of the principal authorities.

3 hrs., throughout the year. M, 4-6. This course must be preceded by course 109 or 110.

## \*241A-241B. Seminar in Literary Investigation.

(GAYLEY)

Studies in the history of English comedy.

3 hrs., throughout the year. M, 4-6, and a third hour by arrangement. Open only to candidates for higher degrees.

\* To be given, 1919-20.

- \*242. Seminar in the Comparative Study of Literature.** (HART)  
Subject to be announced.  
3 hrs., throughout the year. M, 2-4, and a third hour by arrangement.  
Open only to candidates for higher degrees.
- \*243A-243B. Liberalism in Modern English Prose** (CORY)  
Seminar. Reading and reports. Intensive analysis of selected philosophical, economic, political, and educational essays by Hooker, Locke, Berkeley, Hume, Adam Smith, John Stuart Mill, Huxley, and William James.  
3 hrs., throughout the year. F, 4-6, and a third hour by arrangement.
- 245A-245B. Seminar in the Romantic Movement.** (SANFORD)  
The naturalistic development from James Thomson to A. J. Numby. A critical and historical study of naturalistic writers from Thomson to Wordsworth (first half-year); from Wordsworth to Numby (second half-year).  
3 hrs., throughout the year. M W, 11; F, 1. As preparation for this course, students are advised to take courses 115B, 119A, 119B.
- 246. The English and Scottish Popular Ballads.** (GORDON)  
Seminar. Restricted to candidates for higher degrees.  
3 hrs., second half-year, to be arranged.
- \*249A-249B. Seminar in the Development of Californian Literature.**  
Investigation, reports, discussions, and papers. Open only to graduates who have had course 130 or its equivalent.  
3 hrs., throughout the year. Th, 9-12.
- 250A-250B. Theory of Fiction.** (WELLS)  
Studies in the art of narrative, its principles and structure, with special application to the three orders of narration, impersonal, personal, and fictional; investigation of special authors or selected groups of novels.  
3 hrs., throughout the year. Tu Th, 4-5:30. Prerequisite: graduate standing and the consent of the instructor.
- 253. The Teaching of English in Secondary Schools.** (BRECK)  
4 hrs., either half-year; 3 units. Tu Th, 2-4. Primarily for graduates, but open to seniors who have the consent of the instructor. This course may not be counted towards the graduate credit required for the teacher's recommendation or the master's degree.
- 260A-260B. Special Study.**  
The instructors in English hold themselves ready to assist and advise competent students who may propose plans of special study which meet the approval of the department.

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\*To to be given, 1919-20.

## FRENCH

GILBERT CHINARD, L. ès L., Professor of French.

ALBERT J. CARNOY, Ph.D., LL.D., Professor of Romanic Philology.

\*GUSTAVE FAUCHEUX, B. ès L., B. ès Sc., Associate Professor of French Literature.

JOHN T. CLARK, Ph.D., Assistant Professor of Romanic Philology.

PERCIVAL B. FAY, Ph.D., Assistant Professor of Romanic Philology.

\*LESLIE M. TURNER, D. ès L., Assistant Professor of French.

\*ALFRED SOLOMON, M.A., Instructor in French.

CAROLINE B. SINGLETON, M.A., Instructor in French.

WILLIAM GIRARD, Ph.D., Instructor in French.

JOHN A. MAGNI, Ph.D., Instructor in French.

LOUIS BARNIER, A.B., Instructor in French.

NEMOURS HONORÉ CLEMENT, M.A., Instructor in French.

EUGENE JORALEMON, A.B., Assistant in Romanic Languages.

## LOWER DIVISION COURSES

## AB. Elementary French. (GIRARD, BARNIER, SINGLETON)

Stress is laid on accurate pronunciation, on the essentials of grammar, and on careful translation into idiomatic English of simple French prose. The equivalent of matriculation subject 15a<sup>1</sup>.

5 hrs., either half-year. First half-year: M Tu W Th F, 8, 9, 10, 1, 2; second half-year: M Tu W Th F, 8, 1, 2.

## CD. Elementary French (Continuation of AB). (CLARK, FAY, MAGNI, BARNIER, SINGLETON)

Further study of grammar, especially syntax. Reading of contemporary French prose, plays, and some verse; conversation and composition. The equivalent of matriculation subject 15a<sup>1</sup>.

5 hrs., either half-year. First half-year: M Tu W Th F, 8, 9, 10, 1, 2, 3; second half-year: M Tu W Th F, 8, 9, 10, 1, 2. Students will continue under the same instructor and in the same section as in AB. Changes in section may be made only by permission of the head of the department.

## E-F. Intermediate French. (GIRARD, MAGNI, BARNIER)

A detailed study of syntax; dictation and memorizing of prose and verse; selections from novels and historical texts. The equivalent of matriculation subject 15a<sup>1</sup>.

3 hrs., throughout the year. M W F, 8, 9, 10. [Section III at 9 o'clock, Mr. Barnier, open only to candidates for the teacher's recommendation and to students who intend to have a major in French; limited to twenty-five, admitted by special permission of the instructor.] Prerequisite: courses AB, CD or credit for matriculation subject 15a<sup>2</sup>, or its equivalent, or a special examination.

\* Absent on leave, 1918-19; <sup>1</sup> for the duration of the war; <sup>2</sup> in residence second half-year only.

EF. Intermediate French (Continuation of CD of first half-year).  
(CLEMENT, GIRARD, and Assistants)

Syntax, conversation, and rapid reading.

5 hrs., second half-year. M Tu W Th F, 8, 1, 2.

3A. Introduction to Technical and Army French. (CHINARD)

2 hrs., first half-year. Tu Th, 10. Limited to twenty-five, admitted by special permission of the instructor and intended mainly for students in the Students' Army Training Corps. Prerequisite: AB, CD or its equivalent. May be taken with E.

UPPER DIVISION MAJOR COURSES

103A-103B. The Nineteenth Century. (CLARK, FAY, GIRARD)

A detailed study of standard authors, prose and verse, with dictation and reports on assigned themes, conducted mainly in French. Candidates will be admitted only by special permission, after consulting one of the above instructors.

3 hrs., throughout the year. M W F, 8, 9, 10, 2. Prerequisite: course E-F or EF or credit for matriculation subject 15a, or its equivalent, or a special examination.

106A-106B. Grammar and Conversation. (CARNOY, CLARK)

Exercises in written and oral expression. It is advisable to take this course in connection with course 103A-103B. Special permission to enroll must be obtained from one of the above instructors.

2 hrs., throughout the year. Tu Th, 8, 9, 2. Prerequisite: same as for course 103A-103B.

107A-107B. A Survey of French Literature. (CHINARD)

A study of the principal writers with selections from their most important works. Conducted in French and open only to seniors.

2 hrs., throughout the year. Tu Th, 9.

117A-117B. Teachers' Course. (CHINARD)

Methodology, bibliography, analysis of French texts, study of style. For those who intend to teach or prepare for advanced studies. Open only to seniors and graduates.

2 hrs., throughout the year. Tu Th, 11.

120A-120B. Classical Drama. (FAY)

(A) Corneille and Racine, with collateral study of Descartes and Pascal.

(B) Molière and the comedy of character; brief consideration of La Fontaine and La Bruyère.

2 hrs., throughout the year. Tu Th, 9.

## 129A-129B. Special Study.

(The STAFF)

Any instructor in Romanic languages will advise and assist students who propose to undertake special advanced study.

## 130A-130B. Grammar, Composition, and Conversation. First Course.

(FAY)

2 hrs., throughout the year. Tu Th, 11. Prerequisite: section III of E-F (BARNIER), or special permission of the instructor; chiefly for candidates for the teacher's recommendation.

## 130C-130D. Studies in French Style and Practice in Composition. Second Course.

(CARNOY)

2 hrs., throughout the year. Tu Th, 10. Prerequisite: first or second grade in course 130A-130B, or special permission of the instructor.

## 132A-132B. General Introduction to Romanic Philology.

(CARNOY)

2 hrs., throughout the year. Tu Th, 11. Prerequisite: course 103A-103B, or 106A-106B, or 130A-130B.

## \*134A-134B. The Syntax of the Seventeenth Century.

(FAY)

2 hrs., throughout the year. Tu Th, 11. Prerequisites: course 103A-103B, or 106A-106B, or 130A-130B.

## 136A-136B. History and Literature.

(JORAEMON)

The historical background of the chief periods of the Romanic literatures. Reading and reports. For candidates for the teacher's recommendation.

2 hrs., throughout the year. Tu Th, 1.

## 140A-140B. A General Introduction to the History of Speech. (CARNOY)

For all students who specialize in languages.

2 hrs., throughout the year. M W, 11.

Attention is directed to Political Science 119.

## GRADUATE COURSES

## 201A-201B. Modern French Literature.

(CHINARD)

A detailed study of some important French writers.

2 hrs., throughout the year. M, 3-5.

## 212A-212B. Historical French Grammar.

(CLARK)

Investigation in special topics.

2 hrs., throughout the year, to be arranged. Prerequisite: course 132A-132B.

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\*Not to be given, 1918-19.



- 220A-220B. Seminar in Romanic Philology. (CARNOY)  
 Lectures, assignments, and written reports twice a month.  
 1 hr., throughout the year. M, 4.
- 225A-225B. Old French. (CARNOY)  
 Rapid reading: *Chanson de Roland*; *Aucassin et Nicolette*; *Lais* of Marie de France.  
 2 hrs., throughout the year. Th, 4-6. Prerequisite: permission of the instructor.
- 229A-229B. For students who wish to undertake special advanced work in French. (CHINARD)  
 Hours and credit to be arranged.
- 231A-231B. Seminar in French Literary Investigation. (CHINARD)  
 2 hrs., throughout the year, to be arranged.

**GEOGRAPHY**

RULIFF S. HOLWAY, M.S., Associate Professor of Physical Geography.

BURTON M. VARNEY, M.A., Instructor in Meteorology.

———, Teaching Fellow in Geography.

*Honor-students in the Upper Division.*—Candidates for honors in geography must take course 103 or 118 in the senior year. Not more than 8 units of related work in other departments may be counted as an integral part of an approved plan of work. A summer field course in physiography is recommended.

Courses 1b and 1c are the usual prerequisites for upper division work. Either may be taken without prerequisite, but course 1a is a desirable introduction. Geology 6 should be taken preferably in the sophomore year.

**LOWER DIVISION COURSES****1A. Fundamentals of Modern Geography.****(HOLWAY)**

Scope and problems of modern geography. Present polar exploration as a type of a great problem nearing completion, the scientific investigation and mapping of the elements of geographic environment, a great problem of the present. Maps, the technical language of geography; properties and uses of map projections. Nature and function of international boundaries. Influence of geographic environment on man and his affairs. Major geographic conditions of each continent. Geographic control of production and of trade routes. Designed primarily to meet the needs of students in the College of Commerce.

3 hrs., first half-year. M W F, 8. Map work and recitations, four sections: I, Th, 10; II, Th, 11; III, Th, 3; IV, F, 1.

**Introduction to Economic Geography. [Economics 3A.]**

The relations between geography and economic.

3 hrs., second half-year. M W F, 8. Prerequisite: Geography 1A.

**1B. Elementary Meteorology.****(VARNEY)**

A study of the earth's atmosphere and the changes in it which produce our weather. Storms and their movements. Frost and frost fighting. Weather phenomena of California as illustrations of the working of meteorological processes. Study of weather maps and the fundamental principles of weather forecasting. Recording and plotting of meteorological data. Practical work with meteorological instruments.

6 hrs., second half-year; 4 units. Lectures, M W F, 8; laboratory sections, M Tu, 1-4.

1c-2c. Elements of Physiography.

(HOLWAY and VARNEY)

A combination of courses 1c and 2c. Lectures are taken with 1c and field and laboratory with 2c.

4 units, first half-year.

1c. Elementary Physiography.

(HOLWAY)

An introduction to the study and appreciation of land-forms. Topographic control of man's activities. Crustal movements and the resulting initial land-forms. Volcanoes and lava flows. Erosional forces and the processes of degradation. The evolution of topography in a geographic cycle under humid, arid, or glacial conditions. Not open to students who have taken course 1A prior to 1916.

4 hrs., first half-year; 3 units. M W F, 10. Six recitation and map study sections: I, M, 11; II, M, 2; III, M, 3; IV, Tu, 8; V, Tu, 10; VI, Tu, 11.

2c. Map and Field Study of Physiography.

(HOLWAY, VARNEY)

Open to students who have taken or are taking 1c. Each section limited to twenty students. Four or five all day field trips on Saturdays each counting as two half-day sections.

3 hrs., first half-year; 1 unit. Section I, Tu, 1-4; II, W, 1-4.

UPPER DIVISION MAJOR COURSES

102. Field Physiography.

(HOLWAY)

The topography in the vicinity of San Francisco Bay. The observation and interpretation of topographic forms.

3 units, second half-year; eight field days. Agreed Saturdays and one trip, Th to S, inclusive. Lectures, Tu Th, 10. Prerequisite; elementary physiography or geology. Traveling expenses may amount to \$15. Prescribed for the major in physical geography.

103. Special Field Studies.

(HOLWAY)

Additional field investigation under direct supervision of the instructor in charge, either during the academic year or as intersession work. Open to qualified students by special permission, 1 to 4 units, to be arranged.

113. Climatology.

(VARNEY)

A study of the factors which control climate in different parts of the world, considered especially in their relation to human activities. The climate of the United States as an illustration of climatic controls, with particular reference to the climate of California.

3 hrs., first half-year. 3 units. M W F, 8. The Friday appointment will usually be devoted to discussions of readings, map work, etc., assigned in connection with the lectures. Prerequisite: elementary meteorology.

115. Physiography of California. (HOLWAY)  
The physical features of California, with particular reference to the causes and processes involved in the evolution of topographic forms.  
3 hrs., second half-year; 3 units. M W, alt. F, 9, and two hours laboratory work to be arranged. Prerequisite: elementary physiography.
- 116A. Geography of the Americas: North America. (VARNEY)  
The topography, climate, and natural resources of North America, and their relations to the economic geography of the continent.  
4 hrs., first half-year; 3 units. Lectures, M F, 10; map work, W, 10-12. Prerequisite: a lower-division course in geography, or its equivalent.
- 116C. Geography of Europe. (VARNEY)  
The topography, climate, and natural resources of Europe, and the relation of these geographic conditions to human activities. Geographic influences on the causes of the war, and on the progress of the military campaigns. Collateral readings.  
4 hrs., second half-year; 3 units. Lectures, M F, 10; map work, W, 10-12. Prerequisite: a lower-division course in geography, or its equivalent.
117. Relief Modeling. (VARNEY)  
Laboratory work in making relief models. Limited to four students. Either half-year. The consent of the instructor must be obtained before enrollment. Normally 1 unit of credit. Prerequisite: 1A or 1C.
118. Advanced Physiography. (HOLWAY)  
Recent physiographic publications and the principles controlling the evolution of topography.  
3 hrs., second half-year. M W F, 10. Prerequisite: courses 102 and 115. Prescribed for seniors taking physical geography as a major subject.
119. Advanced Physiography. (HOLWAY)  
Special assignments and the preparation of a thesis in connection with course 118. Hours and credit to be arranged.
121. Current Developments in Meteorology and Climatology. (VARNEY)  
Conferences, readings and reports on matters of interest in the current literature of these sciences.  
2 hrs., second half-year; 2 units. Hours to be arranged. Prerequisites: Geography 1B and 113, or their equivalents.
127. Geographic Influences in the Development of the United States. (HOLWAY)  
An introduction to the study of the general principles of modern geography involved in the influence of topography and climate of the United States upon location of cities and trade routes and upon man and his activities.  
2 hrs., first half-year. Tu Th, 9. Prerequisite: course 1A or its equivalent.

**N150. Oceanography and Marine Meteorology. (HOLWAY, VARNEY)**

The ocean and the ocean basins. Waves, tides, and currents. Marine meteorology: general winds of the world and their control of ocean climates; storm types of the different oceans; principles of weather forecasting at sea; fogs; causes, distribution and relation to marine signalling. Use and meaning of various maps and charts. Designed especially for students in the Course Preparatory for Naval Service.

4 hrs., each half-year; 3 units. Tu Th, 10, Th, 1-3.

**GRADUATE COURSES**

**219. Research. (HOLWAY)**

Students who register for field work should have at least two days free each week or, preferably, should register for summer work. This course may also include library study in collating geographical data from scientific reports of Pacific Coast work in geology, botany, irrigation, and other allied subjects.

Not less than 2 units each half-year. W, 3-5.

**\*220. The Teaching of Physical Geography. (HOLWAY)**

The teaching of physical geography in secondary schools, with a study of recent text-books, laboratory manuals, and laboratory and field work. Particular attention is given to the selection from the elementary sciences of experimental and observational work that is fundamental to the appreciation of geographic processes and relations. The plan of work is based upon the customary assignment of physical geography to the first year of the high school.

4 hrs., second half-year; 2 units. Tu Th, 3-5.

The opportunity for research work in the physical geography of California is almost unlimited. No state in the Union has a greater variety of topographical forms and as yet practically nothing but the most general study of these forms has been made. Within a short distance of the University the coast line topography is most striking and many special problems in connection with ocean terraces and sea-cliff erosion will yield valuable results. Peculiarities of drainage, fault zone topography, and remnants of former geographic cycles are almost at our doors. Within the limits of the state, problems varying from the study of living glaciers to the erosion conditions of the most arid deserts are available for investigation by qualified students. The meteorology and climatology of the state also offer abundant work for original observations, and the extensive data collected by the Weather Bureau may be used for study in this field.

In addition to the field work suggested above, there is need for extensive research in the University Library in order that geographical data scattered throughout the various scientific reports on the geology, botany, water supply, etc., of the coast may be gathered and made available in connection with direct geographic surveys.

Opportunities are by no means confined to physical geography, for problems of equal interest in commercial geography are multiplying with the rapid growth of the coast cities and with the transportation changes under modern conditions.

\*Not to be given, 1918-19.

**GEOLOGY AND MINERALOGY**

\*ANDREW C. LAWSON, Ph.D., Professor of Mineralogy and Geology.

JOHN C. MERRIAM; Ph.D., Professor of Palaeontology and Historical Geology.

GEORGE D. LOUDERBACK, Ph.D., Professor of Geology.

ARTHUR S. EAKLE, Ph.D., Associate Professor of Mineralogy.

ELMER F. DAVIS, Ph.D., Instructor in Mineralogy and Geology.

NICHOLAS L. TALIAFERRO, B.S., Instructor in Geology.

ROY R. MORSE, B.S., Teaching Fellow in Geology and Mineralogy.

*Honor-students in the Upper Division.*—The programmes of honor-students, must be approved by the department not later than the beginning of the senior year. All such programmes must include Geology 102A-102B and Geology 112, or Mineralogy 106A-106B. Honors will be awarded on the basis of excellence in the major.

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**GEOLOGY**

There are no laboratory deposits in this department.

**LOWER DIVISION COURSES**

1A. Lectures on General Geology: Dynamical and Structural.

(LOUDERBACK)

3 hrs., first half-year. M W F, 9. Prerequisite. elementary chemistry and physics.

NOTE.—Students who intend to make geology a major study in the later years of their course are advised to take this course as early as possible.

1B. Lectures on General Geology: Historical.

(MERRIAM)

2 hrs., second half-year. Tu Th, 10. Prerequisite: course 1A or Palaeontology 1.

6. Practical Work in Palaeontological Geology. (MERRIAM, CLARK)

Given in connection with course 1B. Laboratory work and excursions.

For the purpose of studying a representative series of the geological horizons and of the fossils of the Coast Ranges in the field, seven excursions to points of interest near Berkeley are made on convenient Saturdays during the term.

4 hrs., second half-year; 2 units (1 unit laboratory; 1 unit excursion).

Open to students who have completed or are taking course 1B.

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\*Absent on leave, 1918-19.

## UPPER DIVISION MAJOR COURSES

## 102A-102B. Field Geology.

(LOUDERBACK and DAVIS)

An inquiry by the student into the geological conditions which obtain in the region around the Bay of San Francisco, with occasional more extended excursions to points of special interest; training in methods of field observation and interpretation of results.

Year course; 2 units each half-year; at least fifteen field days during the year. Credit in this course is given only to students who take the year's work, but supplementary credit may be given at the rate of one unit for eight days additional field work. Concurrently with the field work the class meets for lectures, exercises in geological mapping, discussion of methods, interpretation of observations and reading of geological maps. Prerequisite: Geology 103AB, which may be taken concurrently. Students taking this course may be called upon to make excursions entailing an outlay for traveling expenses of \$25.

Saturdays.

## 102C. Lectures on Economic Geology. Metalliferous Deposits. (LOUDERBACK)

3 hrs., second half-year. M W F, 10. Prerequisite: course 1A and Mineralogy 1A, 1B.

## 102D. Economic Geology. Non-metalliferous Deposits.

(DAVIS)

2 hrs., first half-year. Tu Th, 9. Prerequisite: course 1A and Mineralogy 1A, 1B.

## 103AB. Introduction to Petrology.

(LOUDERBACK, MORSE)

(A) The general characteristics, origin, mode of occurrence, and nomenclature of rocks and description of the more common types.

(B) Laboratory practice in the determination of textures, mineral components, and systematic position of rocks by direct observation of hand specimens.

8 hrs., first half-year; 4 units. Lectures, M W, 10; laboratory, W Th, 1-4. Prerequisite: Geology 1A, Mineralogy 1A and 2A, 2B. To students in the Mining, Metallurgy and Petroleum Engineering options in the College of Mining only one period of laboratory is prescribed, making 5 hours, 3 units credit for the course.

## 104A. Petrographical Laboratory.

(TALIAFERRO)

The optical properties of crystals and methods of investigation by means of the polarizing microscope. Laboratory and lectures.

7 hrs., first half-year; 3 units. Tu, 11; Th F, 1-4. Prerequisite: Mineralogy 2A, 2B.

## 104B. Petrographical Laboratory.

(TALIAFERRO)

Study of rocks with the aid of the microscope. A general introduction to practical petrology. Laboratory and lectures.

6 hrs., second half-year; 2 units. Th F, 1-4. Prerequisite: courses 103AB and 104A.

107. Lectures on the Physical Geology of North America. (TALIAFERRO)  
2 hrs., second half-year. Tu Th, 4. Prerequisite: course 1A and Mineralogy 1A, 1B.
112. Undergraduate Thesis Course.  
The investigation of a problem individually chosen, with a formal report on the results. An introduction to independent research. If the subject chosen is properly approved, the completion of this course fulfills the thesis requirement for the degree of B.S. in the College of Mining. Admission to the course, hours, and subject matter must be individually arranged with the instructor under whom the student chooses to do the work.  
Throughout the year; 2 units each half-year. Credit in this course is given only to students who take the year's work.
114. Earthquakes; an Introduction to Seismology. (DAVIS)  
The phenomena of earthquakes in relation to physical and geological principles involved in their causation and in the methods of their investigation. Lectures.  
2 hrs., first half-year. M W, 11. Prerequisite: elementary physics and course 1A or its equivalent.
115. Instrumental Seismology. (DAVIS)  
Instrumental methods of investigating earthquakes. The care and operation of seismographs with practice in the routine work of a seismographic station. The principal types of instruments employed for earthquake registration.  
2 units; hours to be arranged. Prerequisite: course 114.
116. Tectonic Geology. (DAVIS)  
The phenomena of folding and faulting. Graphic solution of fault problems.  
2 hrs., second half-year. Tu Th, 8. Prerequisite: a working knowledge of descriptive geometry and courses 1A and 102A-102B.

#### GRADUATE COURSES

210. Inorganic Geology. (LOUDERBACK)  
Discussions of special topics and advanced problems. Critical reviews of current literature. Prosecution of original geological research and publication of results.



209. Geology of California.

(LOUDERBACK)

\*(A) From the earliest times to the opening of the Tertiary.

(B) From the post-Jurassic revolution to the present time.

Lectures outlining the geological history of sedimentation, volcanic activity, the major earth movements, and geographical changes in California and bordering territory. Reviews of the literature, discussions of evidence, and field methods. Map studies and preparation of reports.

2 hrs., second half-year. M W, 11 (hours may be changed to suit class). Open to graduates and seniors who have completed a course in historical geology, such as 1B or 107, and a course dealing practically with rocks, such as 102A-102B or 103AB.

214A-214B. Advanced Laboratory and Field Work.

(LOUDERBACK)

One or more of the following lines may be pursued: (a) Special methods—isolation of rocks constituents, study of minerals in grains, special optical and other physical methods, chemical and micro-chemical testing. (b) Systematic study of a wide range of rock types with references to literature, and critical discussions. (c) Special study of rocks of selected provinces with their geographical and petrological relations. (d) Applications of petrographical methods of study of vein and ore minerals, opaque minerals, alternation products, metasomatism, etc. (e) Research. Descriptive, genetic and experimental problems. Combined field and laboratory studies. (f) Seminar in petrographic geology. The general topic for 1914-15 was the natural history of igneous rocks; for 1916-17, contact metamorphism; for 1917-18, geology and petrogenesis in the desert.

Throughout the year. Credit value to be fixed in each case.

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\*Not to be given, 1918-19.

**MINERALOGY****LOWER DIVISION COURSES**

- 1A. Determinative Mineralogy. (EAKLE)  
Practice in determination of minerals by their physical properties.  
6 hrs., first half-year; 2 units. Sec. I, M F, 1-4; Sec. II, Tu Th, 9-12.  
Prerequisite: matriculation chemistry. Deposit, \$2.50.
- 1B. Determinative Mineralogy. (EAKLE)  
Practice in the determination of minerals by use of the blowpipe and chemical reagents.  
6 hrs., second half-year; 2 units. Sec. I, M W, 1-4; Sec. II, Tu Th, 9-12. Prerequisite: matriculation chemistry. Deposit, \$2.50.
- 2A. Crystallography. (EAKLE)  
Lectures on the morphology of crystals.  
2 hrs., second half-year. M W, 9.
- 2B. Crystallographical Laboratory. (EAKLE)  
Practice in the determination of the forms of crystals and in the methods of crystal projections. May be taken only in conjunction with course 2A and is required of all students taking that course.  
2 hrs., second half-year; 1 unit. Sec. I, F, 1-3; Sec. II, Th, 1-3.

**UPPER DIVISION MAJOR COURSES**

- 102c. Physical Mineralogy. (EAKLE)  
Lectures on the physical properties of crystals.  
1 hr., first half-year. F, 9. Prerequisite: courses 1A, 1B, 2A, 2B.
103. Descriptive Mineralogy. (EAKLE)  
The classification, properties, modes of occurrence, and uses of minerals. Lectures and laboratory practice for the study and discussion of minerals.  
2 hrs., second half-year. Lectures, M W, 11; laboratory hours to be arranged. Prerequisite: courses 1A, 1B, 2A, 2B.
104. Gems and Precious Stones. (EAKLE)  
Lectures on the kinds and properties of gem minerals, their occurrences and history. Courses 104 and 105 are given alternately.  
2 hrs., first half-year. M W, 11.

**\*105. Paragenesis of Minerals.****(EAKLE)**

Lectures on mineral formation, associations, and synthetic production.

Courses 104 and 105 are given alternately.

2 hrs., first half-year. M W, 11.

**106A-106B. Undergraduate Thesis Course.**

The investigation of a problem individually chosen, with a formal report on the results. An introduction to independent research. If the subject chosen is properly approved, the completion of this course fulfills the thesis requirement for the degree of B.S. in the College of Mining. Hours, subject matter and admission to the course must be arranged individually with the instructor under whom the student chooses to do his work. Required of undergraduates electing a major in mineralogy.

Year course; 2 units each half-year.

**107. Mineralogical Laboratory.****(EAKLE)**

One or more of the following lines of study may be pursued: (a) Systematic study of selected suites of minerals. (b) Practice in measuring and drawing crystals. (c) Practice in the quantitative analyses of minerals. Admission to the course by individual arrangement. Credit to be based on the character of the work done.

Prerequisite: course 103.

**GRADUATE COURSES**

In physical and chemical mineralogy, little has been done with the minerals of California, and the University collections contain an abundance of material suitable for work in these fields.

To the student who wishes to devote his attention to the genesis of minerals, their associations and their occurrences, this state offers exceptional advantages. The mineralogy of California is very incompletely known and few mineral deposits have been described. There are numerous contact zones, pegmatitic dikes, veins, and dry lake deposits, all possessing a varied assortment of minerals, which afford attractive problems for investigation.

**207. Advanced Crystallography.****(EAKLE)**

This course includes practical work in the measurement of crystals, the calculation of forms and the various methods of graphical representation.

**208. Advanced Mineralogy.****(EAKLE)**

In this course the student is given the opportunity to obtain a wider and more thorough knowledge of minerals than is possible in the undergraduate courses. Qualified undergraduates may be admitted to the course. Subjects for theses may be chosen in either of the courses 207 or 208.

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\*Not to be given, 1918-19.

## GERMAN

HUGO K. SCHILLING, Ph.D., Professor of the German Language and Literature.

ALBIN PUTZKER, M.A., Professor of German Literature, Emeritus.

J. HENRY SENGER, Ph.D., Professor of German, Emeritus.

CLARENCE PASCHALL, M.A., Associate Professor of German.

<sup>3</sup>CLAIR HADYN BELL, M.L., Instructor in German.

FRANKLYN SCHNEIDER, Ph.D., Instructor in German.

LAWRENCE M. PRICE, Ph.D., Instructor in German.

ALICE P. TABOR, Ph.D., Instructor in German.

RALPH H. RING, M.A., Assistant in German.

Since at the present time there is no demand for high school teachers of German, the courses specially designed for the training of such teachers have been omitted. Students who already have nearly completed their work for the teachers' recommendation will, however, be given the opportunity to satisfy all the requirements.

*Honor-students in the Upper Division.*—Upper division students who have completed with high standing courses AB, CD, EF, or their equivalent, and who have received the junior certificate with honorable mention, or who have the recommendation of the department, may be admitted, on application to the secretary of the department, to candidacy for honors. Such candidates will be required to complete with high standing an approved programme of courses including, normally, 24 units of upper division work in German. The department does not prescribe any definite programme, but it will, as a rule, insist upon a good practical command of the language, and a general knowledge of German literature. To this end, course 118A-118B will constitute a part of each programme, and likewise, unless these courses shall have been taken already in the lower division, courses 106A-106B and 106C-106D. In the case of candidates who are already well advanced in German and whose plan of study makes it desirable for them to take certain courses in allied departments, permission may be given to count such courses in partial satisfaction of the 24 units required for the major, and to count upper division courses in German taken in the freshman or sophomore year.

## LOWER DIVISION COURSES

M<sup>1</sup>-M<sup>2</sup>. Elementary German for Military Use.

(PRICE)

The course is designed to give prospective soldiers sufficient practical mastery of German to enable them to question prisoners, read German documents, military orders, letters, diaries, etc. The reading texts will be selected with a view to the acquisition of a military vocabulary. Open only to men who are or expect to be in military service.

3 hrs., throughout the year, to be determined at a meeting to be announced at the beginning of the half-year.

<sup>3</sup> Absent on leave for the duration of the war.

AB. Elementary German. (PRICE, PASCHALL, TABOR)  
5 hrs., either half-year. First half-year: M Tu W Th F, 8, 9; second half-year: M Tu W Th F, 9. The course corresponds to matriculation subject 15b<sup>2</sup>.

CD. Elementary German (continuation of AB). (PRICE, TABOR)  
5 hrs., either half-year. First half-year: M Tu W Th F, 9, 10; second half-year: M Tu W Th F, 8, 9. The course corresponds to matriculation subject 15b<sup>3</sup>.

E-F. Intermediate German. (SCHNEIDER, PRICE)  
Selections from prose and poetry, ordinarily including one of Schiller's dramas; grammar and composition. The course is conducted mainly in German. It corresponds to matriculation subject 15b<sup>4</sup>.  
3 hrs., throughout the year. M W F, 8, 9. Prerequisite: course CD or credit in matriculation subject 15b<sup>3</sup>.

EF. Intermediate German (continuation of CD). (SCHILLING, PRICE, TABOR)  
5 hrs., either half-year. First half-year: M Tu W Th F, 1; second half-year: M Tu W Th F, 9, 10. Identical in scope and subject matter with course E-F.

3A-3B. Introduction to Technical Reading. (RING)  
If the enrollment warrants it, there will be separate sections for students in the College of Chemistry and for pre-medical students.  
3 hrs., throughout the year. M W F, 8, 1. Prerequisite: course CD or credit in matriculation subject 15b<sup>3</sup>.  
Course 3A-3B provides special training in the reading of more or less technical texts. The regular courses leading to the upper division courses in German are E-F and EF. Students who have had course 3A-3B may, however, take course 106A-106B; and they may be admitted to courses 105A-105B and 110A-110B, if they take at the same time course 106A-106B, or satisfy the department that they are not deficient in grammar and composition.

#### UPPER DIVISION MAJOR COURSES

The courses in this group (except course 121b) are conducted in German.

103A-103B. Advanced Scientific German. (RING)  
2 hrs., throughout the year. Tu Th, 8. Primarily for pre-medical students.

105A-105B. Classics of the Eighteenth Century. (PASCHALL)  
Selected works of Lessing, Goethe, and Schiller.  
3 hrs., throughout the year. M W F, 1. Prerequisite: same as for 104A-104B.

106M<sup>1</sup>-106M<sup>2</sup>. Advanced German for Military Use. (PASCHALL)

Mainly conversational practice, with special attention to the knowledge of German needed at the front and in the intelligence service. Open only to men who are or expect to be in military service.

2 hrs., throughout the year, to be determined at the beginning of the session. Prerequisite: the approximate equivalent of lower division German (3 or 4 years of high school German).

## 106A-106B. Grammar, Composition, and Conversation. First Course.

(SCHNEIDER, TABOR)

2 hrs., throughout the year. Tu Th, 8, 11. Prerequisite: same as for course 105A-105B.

## 106C-106D. Grammar, Composition, and Conversation. Second course.

(SCHNEIDER)

2 hrs., throughout the year. Tu Th, 10. Prerequisite: first or second grade of scholarship in course 106A-106B.

## 106E-106F. Exercises in Conversation.

(SCHNEIDER)

2 hrs., throughout the year; 1 unit each half-year. Tu Th, 1.

This course is supplementary to 106C-106D, and is ordinarily to be taken in connection with that course. Taken alone it does not lead up to 206A-206B. Prerequisite: same as for course 106C-106D. 1 unit.

## 110A-110B. The German Ballad.

(SCHILLING)

German ballad poetry from Goethe and Schiller to the present day.

1 hr., throughout the year. Tu, 11. Prerequisite: same as for course 105A-105B.

## 111A-111B. Novelists of the Nineteenth Century.

(SCHNEIDER)

A course in rapid prose reading. Selected novels of Hauff, Freytag, Ludwig, Keller, Meyer, and others.

2 hrs., throughout the year. Tu Th, 9. Prerequisite: courses 105A-105B, 106A-106B, 110A-110B; or one of the former courses 104A-104B, 107A-107B.

## 118A-118B. General History of German Literature.

(SCHILLING)

First half-year, the Middle Ages; second half-year, from the Reformation to the death of Goethe. Lectures and discussions; collateral reading. Not open to lower division students except by special permission of the instructor.

3 hrs., throughout the year. M W F, 2. Prerequisite: course 105A-105B, or one of the former courses 104A-104B, 107A-107B.

119. Middle High German. (PASCHALL)  
Outlines of grammar. Selections from the Nibelungenlied, the Kudrun, and the epics of chivalry. Translation into modern German.  
3 hrs., first half-year. M W F, 9. Prerequisite: same as for course 118A-118B. This course should be taken together with or after (but not before) 118A-118B.
- 121D. German Phonology and Orthography. (PASCHALL)  
1 hr., second half-year. M, 3.
- 150A-150B. Special Study.  
Topics selected with the approval of the department and studied privately under the direction of one of the instructors. This course is intended primarily for graduates students in absence.

## GRADUATE COURSES

Prerequisite: for the literary courses, course 118A-118B; for those in philology, ordinarily, courses 119A and 106C-106D.

- 206A-206B. Composition. Third course. (SCHNEIDER)  
Themes and essays. Practice in the correcting of written exercises. One conference a week with each student, at an hour to be appointed by the instructor. 2 units each half-year. Prerequisite: first or second grade of scholarship in course 106C-106D. This course cannot be credited in satisfaction of the requirement of graduate work for the master's degree unless the student has already completed an equal amount of approved graduate work.
- 210A-210B. English Influences upon German Literature. (PRICE)  
First half-year: the Eighteenth Century, with particular reference to Goethe; second half-year: Shakespeare in Germany. Pro-seminar.  
2 hrs., throughout the year, to be arranged.
- 223A-223B. The Poems of Goethe. (SCHILLING)  
1 hr., throughout the year. Th, 2.
- 226A-226B. German Literature in the Nineteenth Century. (TABOR)  
The drama up to 1880.  
2 hrs., throughout the year. M W, 11.
- 250A-250B. Germanic Seminar. (SCHILLING)  
Original investigation in linguistic and literary fields chosen with regard to the needs and wishes of each student. Tu, 7:30-9 p.m.

**GERMANIC PHILOLOGY**

For the courses in English Philology see the department announcement. The courses in Germanic Philology are open to competent undergraduates, at the discretion of the instructor.

**GRADUATE COURSES**

- \*201. Introduction to Germanic Philology. (SCHILLING)  
The Indo-Germanic race, its history, and the phonology of its principal languages. The Germanic sound-shift and the phonological development of the Germanic dialects.  
2 hrs., first half-year.
202. Gothic. (SCHILLING)  
Grammar, with special reference to the other Germanic dialects. Reading.  
3 hrs., second half-year, to be arranged.
- 203A-203B. Old Norse. (PASCHALL)  
Outlines of the grammar; reading.  
2 hrs., throughout the year, to be arranged.
- \*205. Germanic Antiquities. (SCHILLING)

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\*Not to be given, 1918-19.



## GREEK

EDWARD B. CLAPP, Ph.D., LL.D., Professor of the Greek Language and Literature, Emeritus.

ISAAC FLAGG, Ph.D., Professor of Greek, Emeritus.

GEORGE W. BUNNELL, M.A., Professor of Greek, Emeritus.

\*PAUL SHOREY, Ph.D., LL.D., Litt.D., Sather Professor of Classical Literature.

JAMES T. ALLEN, Ph.D., Associate Professor of Greek.

IVAN M. LINFORTH, Ph.D., Associate Professor of Greek.

OLIVER M. WASHBURN, A.B., Assistant Professor of Classical Archaeology.

GEORGE M. CALHOUN, Ph.D., Assistant Professor of Greek.

ROGER M. JONES, Ph.D., Instructor in Greek.

For a more detailed description of the courses in Greek see the separate Announcement of the Department of Greek, 1918-19.

Greek studies properly include not only the language of the Greeks, but all the manifestations of their genius in literature, philosophy, art, history, politics and religion. As far as possible the department of Greek, assisted by members of other departments, aims to provide instruction in all these subjects.

The courses which are offered fall into two classes: (a) those in which a knowledge of the Greek language is required, including the courses for beginners in Greek; (b) those for which a knowledge of Greek is not necessary. But it cannot be too strongly emphasized that a fair knowledge of the language is essential for anything more than a superficial study of the works of the Greeks.

*Honor-students in the Upper Division.*—A student in the upper division may be registered as a candidate for honors in Greek under the following conditions: (1) he must have finished courses A, B, C, D, or their equivalent, and (2) either he must have received honorable mention with the junior certificate, or he must have the recommendation of the department. His work as a candidate will be arranged by himself in consultation with the department in accordance with his special interests and abilities, whether they be literary, historical, philosophical, linguistic, or other. Appropriate courses in other departments will be freely accepted by the Greek department. Course 199 is especially devised for candidates and may consist of any kind of work appropriate for the individual candidate, whether carried on by himself privately, or by conference with instructors, or otherwise. Members of the department hold themselves in readiness to guide and assist candidates in any way whatever.

Honors at graduation will be awarded to those candidates who have shown marked excellence in their work. Normally they will be expected to have taken courses 1, 2, 3A-3B, 101, 102, 103A-103B, and at least two other major courses; but this series of courses is not definitely prescribed.

\* In residence second half-year only.

I. COURSES NOT REQUIRING A KNOWLEDGE OF THE  
GREEK LANGUAGE

## LOWER DIVISION COURSES

49. Centers of Greek Life. (WASHBURN)  
Illustrated lectures on Troy, Pergamon, Priene, Miletus, Delphi, Her-  
culaneum, etc.  
1 hr., second half-year. Tu, 7 p.m.
50. Lectures on Greek and English Poetry. (SHOREY)  
Lectures will outline the history of Greek poetry and trace the influ-  
ence on modern, especially English, literature of each of the three  
chief Greek poetical forms.  
2 hrs., second half-year. Tu Th, 4.
- 55A-55B. Studies in Greek Drama. (ALLEN)  
For scope of lectures, etc., see course 155A-155B.  
2 hrs., throughout the year. Tu Th, 2.

## UPPER DIVISION MAJOR COURSES

- 151A-151B. Greek Religion. (LINFORTH)  
An examination of the principal religious ideas and practices in  
classical Greece. Lectures, readings, reports.  
2 hrs., throughout the year. Tu Th, 11.
- \*152. Greek Government. (CALHOUN)  
The governmental organization of typical Greek states with especial  
attention to Athens and Sparta; reading of the more important  
documents (in translation). A systematic presentation of the  
actual forms of government, rather than a study of Greek political  
theory, is proposed.  
2 hrs., first half-year.
153. Greek Law. (CALHOUN)  
The beginnings of Greek law, the lawgivers, the code of Gortyn, Attic  
law and procedure, Greek international law, Greek law in the  
Hellenistic period; reading of important sources and study of  
cases (in translation).  
2 hrs., second half-year. Tu Th, 2.

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\*Not to be given, 1918-19.

## 155A-155B. Studies in Greek Drama.

(ALLEN)

- (A) Aeschylus, Sophocles.—A study of the dramatic art of Aeschylus and Sophocles, and an interpretation of the life, beliefs, and ideals of Athenians in the fifth century to the death of Pericles, as reflected in the plays of these two dramatists.
- (B) Euripides, Aristophanes, Menander.—The dramatic art of Euripides and of the Old and New Comedy, together with a study of the changes in political, social, and intellectual conditions at Athens during the closing decades of the fifth century and in the fourth century.

Lectures, readings, reports, discussions. Special assignments adapted to advanced students.

2 hrs., throughout the year. Tu Th, 2.

## \*156. Greek Sculpture.

(WASHBURN)

2 hrs., second half-year.

## 158. Greek Architecture.

(WASHBURN)

The historical development of Greek architecture will be studied through the existing remains, and, as far as practicable, with the help of Vitruvius and architectural inscriptions.

2 hrs., second half-year. Tu Th, 3. Prerequisite: junior standing, and either Graphic Art 1A or a reading knowledge of Greek or Latin.

## \*159. Greek Painting.

(WASHBURN)

2 hrs., second half-year.

## 160. Aristotle and Aristotelianism.

(SHOREY)

About six lectures on the writings and philosophy of Aristotle will be followed by about nine lectures on such topics as: From Aristotle to Dante; The Medieval Aristotle; The Humanistic and Platonic Revolt; The Scientific Revolt; Aristotle and the Anti-Aristotelians; The Reign of the Poetics; Aristotle and Modern Science. The lectures will be open to the public. Students who elect the course for credit will be expected to read assigned pages in one or more of the following and similar works: Zeller: History of Greek Philosophy, Aristotle and the Earlier Peripatetics; Gomperz: Greek Thinkers, Vol. IV; Hoffding: History of Modern Philosophy; Grote: Aristotle; Butcher: Edition of Aristotle's Poetics with Essays.

1 hr., second half-year. W, 4.

\*Not to be given, 1918-19.

## II. COURSES REQUIRING A KNOWLEDGE OF THE GREEK LANGUAGE

### LOWER DIVISION COURSES

Students who have credit for matriculation subjects 8 and 9 should take courses 1 and 2 in their freshman year. Students who have credit for matriculation subject 8 only should take courses C and D or CD in their freshman year, and courses 1 and 2 in their sophomore year. Students who have no matriculation credit in Greek should take course A-B in their freshman year and courses C and D in their sophomore year, or courses AB, CD in their freshman year.

#### A-B. Greek for Beginners.

(LINFORTH, JONES)

An introduction to the Greek language based upon graded selections from the works of Menander, Euclid, Aristophanes, Plato, Herodotus, and the New Testament. The method of presentation emphasizes the living phrase, and has as its chief object the acquiring of reading power. Mastery of essential forms, memorizing of quotations; practice in reading at sight.

3 hrs., either half-year. First half-year: A (Linforth), M W F, 10; B (Jones), M W F, 2; second half-year: A (Jones), M W F, 2; B (Linforth), M W F, 10.

#### AB. Greek for Beginners.

(ALLEN, CALHOUN, JONES)

A double course, covering the work of courses A and B in one half-year.

5 hrs., either half-year. First half-year: M Tu W Th F, 8 (Allen) and 3 (Jones); second half-year: M Tu W Th F, 3 (Calhoun).

#### C. Attic Prose.

(CALHOUN)

Reading of Attic prose; study of inflectional forms, syntax, vocabulary; exercises both in rapid reading and close analysis.

3 hrs., first half-year. M W F, 1.

#### D. Introduction to Homer.

(CALHOUN)

Several books of the Iliad; Homeric forms and vocabulary; intelligent and expressive reading of the verse.

3 hrs., second half-year. M W F, 1.

#### CD. Attic Prose and Homer.

(ALLEN, CALHOUN, JONES)

A double course, covering the work of courses C and D in one half-year.

5 hrs., either half-year. First half-year: M Tu W Th F, 3 (Calhoun); second half-year: M Tu W Th F, 8 (Allen) and 3 (Jones).

#### 1. Socrates.

(JONES)

Lectures on the life and times of Socrates; reading of the Apology, Crito, and the close of the Phaedo of Plato.

3 hrs., first half-year. M W F, 9.

## 2. Greek Poetry.

(LINFORTH)

Reading of one tragedy and selections from Homer, the lyric poets, and the dramatists. Lectures and assigned readings on the history of Greek Poetry.

3 hrs., second half-year. M W F, 9.

## 3A-3B. Prose Composition, I.

(ALLEN)

Exercises in writing simple Greek sentences, with special attention to elementary matters of grammar: inflection, syntax and arrangement of words.

1 hr., throughout the year. Tu, 9. Hour subject to change. Pre-requisite: matriculation subject 8 or course A-B, or AB.

## UPPER DIVISION MAJOR COURSES

Courses 101 and 102 are designed to follow courses 1 and 2, and form the proper introduction to the other major courses in which a knowledge of the Greek language is required. Students who have not had courses 101 and 102 should not elect any of the other courses in the following group without consultation.

## 101. Historical Prose.

(CALHOUN)

Reading of selections from Herodotus and Thucydides; training in rapid and intelligent reading of ordinary Greek prose.

3 hrs., first half-year. M W F, 2.

## 102. Introduction to Greek Drama.

(JONES)

Reading of two tragedies and one comedy. Lectures and readings on the technique and presentation of Greek plays.

3 hrs., second half-year. M W F, 2.

## 103A-103B. Prose Composition, II.

(LINFORTH)

Exercises in writing Greek prose, with special attention to the simpler rhetorical principles; particles, balance and antithesis, participles, etc.

1 hr., throughout the year. Th, 9. Hour subject to change. Pre-requisite: course 3A-3B.

## 107. Sophocles.

(LINFORTH)

Careful reading of one play and more rapid reading of two others; interpretation of Sophocles' purpose and method as a literary and dramatic artist.

3 hrs., first half-year. M W F, 9.

## 115. Introduction to the Study of Aristotle.

(SHOREY)

The instruction will be based mainly on the reading of selected chapters in the *Ethics* or *Politics*, or both, as the class may prefer. It is expected that students will take course 160 concurrently with this course.

2 hrs., second half-year. Tu Th, 3.

## 199A-199B. Special Study.

(LINFORTH)

Each student will pursue privately some definite course of reading or investigation, and will report at regular intervals to the instructor. Open only to candidates for honors. Credit will be determined for each student (1-4 units).

## GRADUATE COURSES

The following courses are intended for graduate students only, and one or more of them will be given each year, according to the needs of students. Many graduate students will find it profitable to take also some of the upper division courses for undergraduates.

## \*212A-212B. Seminar in the Attic Orators.

(CALHOUN)

## \*251A-251B. Seminar in Greek Religion.

(LINFORTH)

## 255A-255B. Seminar in Greek Dramatic Representation.

(ALLEN)

The subject of this course will be the Greek theatre and the manner of presenting Greek plays, especially in the fifth century, and its purpose will be to acquaint the student with the problems in this field and with the literature bearing upon these problems that has appeared since the year 1884. Each member of the class will be required to select one or more topics for thorough investigation. (Students admitted to this course will be expected to own complete standard texts of the plays of Aeschylus, Sophocles, Euripides and Aristophanes. A reading knowledge of French and German is essential.)

2 hrs., throughout the year; 2-4 units each half-year. Tu Th, 3.

## 257A-257B. Greek Inscriptions.

(WASHBURN)

Practical exercises in the reading and interpretation of inscriptions of philological, archaeological, and historical interest.

2 hrs., throughout the year. Th, 7:30-9:30 p.m.

Seminar in Archaeology. [See Latin 283.]

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\*Not to be given, 1918-19.

**HISTORY**

H. MORSE STEPHENS, M.A., Litt.D., Sather Professor of History; Dean of the College of Letters and Science.

HERBERT E. BOLTON, Ph.D., Professor of American History and Acting Curator of the Bancroft Library.

FREDERICK J. TEGGART, A.B., Associate Professor of History.

EUGENE I. McCORMAC, Ph.D., Associate Professor of American History.

LOUIS J. PAETOW, Ph.D., Associate Professor of Medieval History.

WILLIAM A. MORRIS, Ph.D., Associate Professor of English History.

CHARLES E. CHAPMAN, Ph.D., Assistant Professor of Latin-American and California History.

HERBERT I. PRIESTLEY, Ph.D., Assistant Professor of History and Assistant Curator of the Bancroft Library.

KARL C. LEEBRICK, Ph.D., Assistant Professor of History.

JAMES J. VAN NOSTRAND, Ph.D., Assistant Professor of Ancient History.

ARTHUR P. WATTS, M.A., Assistant in History.

WALTER C. BARNES, A.B., Assistant in History.

WILLIAM C. BINKLEY, A.B., Assistant in History.

JAMES F. RIPPY, M.A., Assistant in History.

**INFORMATION FOR LOWER DIVISION STUDENTS**

*History 1A-1B.*—Students may satisfy any requirement of history for the junior certificate by taking History 1A-1B. This course is prerequisite to History 101, 103, 111, 121, 141. Freshmen who have done satisfactory work in History 1A-1B will become eligible for admission in their sophomore year to certain upper division courses. Sophomores who wish to enter upper division courses should consult with the instructors in charge. Students who enter the University of California as juniors or seniors may offer a substitute for History 1A-1B.

*Foreign languages in the Lower Division.*—All students who intend to take upper division courses in history are advised to acquire a reading knowledge of French, German, or Spanish before they reach their junior year.

**INFORMATION FOR UPPER DIVISION STUDENTS**

*Classification of Upper Division Courses.*—It will be seen on consulting the list of courses below that, in the upper division, the first course in each field of history ordinarily is a general survey (*cf.* courses 111, 121, 141, 151, 161, 165, 171, 181). These general courses are followed by corresponding advanced courses in which some part of the larger field is studied intensively (*cf.* courses 112, 122-123, 142-143, 152, 155, 166, 172-173, 182, 189). The general (or three-hour) course is in almost all cases a pre-

requisite to the advanced (or two-hour) course in the same subject. No student will be restricted in the choice of upper division courses, but the department is ready to give advice in this matter, especially to students who are looking forward to a higher degree or a teachers' recommendation with history as a major. The department recommends that at least one general (or three-hour) course be followed by a corresponding advanced (or two-hour) course.

*Honor-students in the Upper Division.*—Honors will be conferred only upon students who have completed 24 units of major courses in history with distinction. One of the following two plans must be chosen.

Plan A. The honor-student must complete course 101A-101B, Honor-course: Historiography, Professor Stephens, 4 units each half-year, with distinction.

Plan B. The honor-student must choose three fields of history (such as ancient history, medieval history, modern European history, English history, history of Spain and Spanish America, American history, the history of the West, and California history). He may read for honors in connection with any courses offered in his chosen fields. Ordinarily, he should begin work in these fields not later than the beginning of his junior year, but he will be allowed to begin as late as the beginning of his senior year.

At the end of his senior year a candidate for honors will be required to take a special honor examination in each of his three fields. He must give instructors under whom he intends to take honor examinations at least one half-year's notice, and must obtain the instructor's consent to take such examinations. At the time when he takes honor examinations he shall be excused from all final examinations in the courses which he is taking in his chosen fields.

Not later than January 15 or May 15, preceding graduation a candidate must submit a thesis, presumably one which has grown out of a term paper in one of the courses he has taken in preparation for his honor examination. The thesis must be typewritten, on pages 8½ x 10 inches, and must be in suitable form.

The three instructors in charge of the candidate's chosen fields of work shall constitute a committee of the department to read the honor examination papers, to pass upon the merits of the thesis, and, on the basis of this evidence, shall recommend to the department that honors be granted or not granted. Thereupon the department will take final action.

#### INFORMATION FOR GRADUATE STUDENTS

*General Requirements.*—Students who wish to pursue graduate work in history must register, immediately upon entrance, with the secretary of the department, Mr. L. J. Paetow, 30 Benjamin Ide Wheeler Hall. A member of the department is appointed to supervise the work of each graduate student. Graduates from other institutions, before admission to graduate work, will be tested as to their knowledge of both European and American history.

*Announcement of the Department of History.*—The department issues a separate announcement which contains its requirements for the degrees of Doctor of Philosophy and Master of Arts, and for the teachers' recommendation.



*The Bancroft Library.*—The attention of students is called to the unusual opportunities for historical research offered by the Bancroft collection of manuscripts and books relating to the countries bordering upon the Pacific Ocean from Alaska to Panama. The results of investigations completed in connection with the work of the department appear in the University of California Publications in History and in the Publications of the Academy of Pacific Coast History.

Students who plan to undertake research work in Spanish-American history must have a thorough knowledge of Spanish.

### LOWER DIVISION COURSES

#### 1A-1B. General History. (STEPHENS, LEEBRICK and Assistants)

The growth of western civilization from earliest times to the end of the nineteenth century. An introduction to the study of history, affording a general perspective of the development of society, politics, and literature in Europe. No text-book is used, but a syllabus is provided for the contents of eighty lectures, forty to be delivered each term. The first half-year's work extends to the beginning of the thirteenth century, and the second half-year's work from the thirteenth to the nineteenth century. The class is divided into thirty sections in which recitations are conducted weekly by the assistants in history, who also hold conferences with individual students at stated hours in 131 Library. *Course 1B is not open to freshmen who have not had course 1A.*

3 hrs., throughout the year. M W F, 10.

#### 2B. Historical Geography. (TEGGART)

The influences of geography on history. The physical conditions of the expansion of political units. Historical changes in the political map of Europe.

3 hrs., second half-year. M W F, 2.

### FREE ELECTIVE COURSE

#### 8A-8B. History of the Art of War. (STEPHENS)

A survey of military history. First half-year: from the earliest times to the Napoleonic wars; second half-year: from the Napoleonic wars to the present time. Open to all students.

2 hrs., throughout the year. M W, 4.

#### 92A-92B. History of Europe in the Nineteenth Century, 1815-1914.

(STEPHENS)

2 hrs., throughout the year. Tu Th, 10. Open without prerequisite to upper division students; open to lower division students who have completed course 1A-1B.

## UPPER DIVISION MAJOR COURSES

- 101A-101B. Honor-course: Historiography. (STEPHENS)  
 2 hrs., throughout the year; 4 units each half-year. Tu, 3-5. Prerequisite: course 1A-1B.
- 102A-102B. The Migrations of Peoples. (TEGGART)  
 The origin and significance of the movement of peoples, and the history of these movements as affecting the growth of European civilization.  
 2 hrs., throughout the year. M W, 11.
103. Introduction to the Comparative Study of History. (TEGGART)  
 An examination of the comparative method, more particularly as exemplified in Maine's *Ancient Law*, and an extension to the study of the beginnings of kingship and of political organizations.  
 3 hrs., first half-year. M W F, 2. Prerequisite: course 1A-1B.
- N107. Naval History. (STEPHENS and LEEBRICK)  
 For students in the naval preparatory course.  
 3 hrs., either half-year. M W F, 3.
- 111A-111B. Ancient History. (VAN NOSTRAND)  
 (A) Greek history to the Roman conquest. (B) Roman history to the sixth century A.D.  
 3 hrs., throughout the year. M W F, 8. Prerequisite: course 1A-1B and a reading knowledge of French, or German, or Italian.
- 112A-112B. Roman Imperialism. (VAN NOSTRAND)  
 The effect of expansion upon the institutions of Rome. Success and failure of Rome as an imperial state.  
 2 hrs., throughout the year. Tu Th, 8. Prerequisite: course 1A-1B and a reading knowledge of French or German.
- 121A-121B. Medieval History. (PAETOW)  
 A general survey of European history from about 500 to about 1500, based on Paetow, *Guide to the Study of Medieval History*, Part II.  
 3 hrs., throughout the year. M W F, 9. Prerequisite: course 1A-1B and a reading knowledge of French, or German, or Italian, or Spanish.
- \*122A-122B. Medieval Culture. (PAETOW)  
 From about 500 to about 1300, with special emphasis on the twelfth and thirteenth centuries, based on Paetow, *Guide to the Study of Medieval History*, Part III.  
 2 hrs., throughout the year. Tu Th, 9. Prerequisite: course 121A-121B and a reading knowledge of French or German.

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\*Not to be given, 1918-19.

## 123A-123B. Medieval France.

(PAETOW)

From the Treaty of Verdun to Louis XI. A general survey of political and social history. Considerable emphasis is laid on the history of institutions: (A) Feudal institutions; (B) Monarchical institutions.

2 hrs., throughout the year. Tu Th, 9. Prerequisite: course 121A-121B and a reading knowledge of French.

## \*131A-131B. Renaissance and Reformation.

3 hrs., throughout the year.

## 141A-141B. Modern European History.

(LEEBRICK)

Lectures on the history of Europe from about 1500 to 1878, based on Stephens, *Syllabus of a Course of Lectures on European History*.

3 hrs., throughout the year. M W F, 2. Prerequisite: course 1A-1B and a reading knowledge of French, or German, or Italian, or Spanish.

## \*142A-142B. The French Revolutionary Period in Europe. (STEPHENS)

An intensive study of the French Revolution from 1789 to 1799, and its influence on Europe.

2 hrs., throughout the year. Tu Th, 2. Prerequisite: course 141A-141B and a reading knowledge of French.

## \*143A-143B. The Napoleonic Period in Europe.

(STEPHENS)

An intensive study of the Napoleonic Period from 1799 and 1815, and its influence on Europe.

2 hrs., throughout the year. Tu Th, 2. Prerequisite: course 141A-141B and a reading knowledge of French.

## 151A-151B. History of England.

(MORRIS)

Lectures on the political and constitutional history of England with the study of documents contained in Adams and Stephens, *Select Documents of English Constitutional History*.

3 hrs., throughout the year. M W F, 8.

## 152A-152B. Constitutional History of England.

(MORRIS)

A detailed study of the origin and growth of the English Constitution. Especially designed for students of law.

2 hrs., throughout the year. Tu Th, 1. Prerequisite: course 151A-151B (may be waived by the instructor).

## \*155A-155B. History of the British Empire.

(STEPHENS)

(A) History of English colonies and dependencies; Colonial administration; India. (B) The West Indies, British Africa, North America, Australia and New Zealand.

2 hrs., throughout the year. Tu Th, 2. Prerequisite: course 1A-1B.

\*Not to be given, 1918-19.

- 161A-161B. History of Spain and Portugal. (CHAPMAN)  
The European background of Hispanic America with special emphasis on institutions.  
(A) To 1516. (B) To date.  
3 hrs., throughout the year. M W F, 8. A reading knowledge of Spanish, Portuguese, or French is desirable.
- \*162A-162B. History of Hispanic America from 1808. (CHAPMAN)  
The wars of independence and the development of Hispanic-American states, with emphasis on their relations to the United States.  
3 hrs., throughout the year. M W F, 8. A reading knowledge of Spanish, Portuguese, or French is desirable.
- 165A-165B. Hispanic-American History to 1810. (PRIESTLEY)  
The discovery and occupation; colonial policies; the development of political, economic, and social institutions, and a comparison of these with the institutional phases of other European expansions.  
3 hrs., throughout the year. M W F, 10. A reading knowledge of Spanish or French is desirable.
- 166A-166B. History of Mexico. (PRIESTLEY)  
The colonial background; the establishment of independence and the development of governmental forms; social and economic problems; relations with the United States; recent revolutionary movements.  
2 hrs., throughout the year. Tu Th, 10. A reading knowledge of a modern language is desirable.
- 171A-171B. American History. (McCORMAC)  
A general course dealing with the English colonies and the political history of the United States.  
3 hrs., throughout the year. M W F, 10.
- 172A-172B. American Constitutional History. (McCORMAC)  
Colonial governments; formation of the national constitutional; historical development of constitutional government in the United States.  
2 hrs., throughout the year. Tu Th, 10. Prerequisite: course 171A-171B (may be waived by the instructor).
- 173A-173B. The Civil War and Reconstruction. (McCORMAC)  
2 hrs., throughout the year. Tu Th, 11.
- 181A-181B. The History of the West. (BOLTON)  
The settlement and development of the West, and its influence upon national and international affairs at each stage of advance. The emphasis will be upon the Trans-Mississippi West.  
3 hrs., throughout the year. M W F, 9.

\*Not to be given, 1918-19.

## 182A-182B. Spain in North America.

(BOLTON)

A general survey of the establishment of Spanish rule and Spanish institutions in North America, followed by a more detailed study of Spanish activities in and relative to territory now within the United States.

2 hrs., throughout the year. Tu Th, 9. Prerequisite: course 161A-161B, 181A-181B, or 183A-183B. A reading knowledge of Spanish is desirable.

## \*183A-183B. European Expansion in North America.

(BOLTON)

Spanish, French, Dutch, Swedish, Russian, and English exploration and settlement in North America in their bearings upon the contest for the possession of the continent and upon the development of colonial policies.

3 hrs., throughout the year. M W F, 9. A reading knowledge of French and Spanish is desirable.

## 189A-189B. History of California.

(CHAPMAN)

The relation of the history of California to that of New Spain, the Far East, and the United States.

2 hrs., throughout the year. Tu Th, 8.

## \*191A-191B. Nineteenth Century History.

3 hrs., throughout the year.

## 192A-192B. History of Europe in the Nineteenth Century, 1815-1914.

(LEEBRICK)

Lectures as in course 92A-92B, with the addition of section work and a term essay.

2 hrs., throughout the year. Tu Th, 10. Prerequisite: course 121, 141, or 151.

## GRADUATE COURSES

## 201A-201B. The Critical Study of Historiography.

(STEPHENS)

2 hrs., throughout the year. Tu, 3-5.

## 202A-202B. Historical Method.

(PAETOW)

The work in the course is based primarily on Langlois and Seignobos, *Introduction to the Study of History*. The second half-year is devoted largely to practical exercises.

2 hrs., throughout the year. M, 2-4.

## 203A-203B. The Theoretical Basis of Historical Study.

(TEGGART)

An examination of modern ideas concerning the scope of history and the conditions of historical knowledge.

2 hrs., throughout the year. W, 3-5.

\*Not to be given, 1918-19.

## 205A-205B. Historical Bibliography.

(TEGGART)

Instruction in the methods of bibliography, followed by a detailed presentation of bibliographical information necessary for historical research.

2 hrs., throughout the year. F, 3-5.

## \*206A-206B. Historical Cartography.

(TEGGART)

A study of the growth of knowledge concerning the world as revealed in cartographical monuments, more particularly since the middle of the fifteenth century.

2 hrs., throughout the year. Hours to be arranged.

## 211A-211B. Ancient History.

(VAN NOSTRAND)

The subject for 1918-19 will be some phase of Roman history.

2 hrs., throughout the year. Th, 3-5.

## 221A-221B. Medieval History.

(PAETOW)

For 1918-19 the subject will be: Hindrances to the advancement of learning in the thirteenth century.

2 hrs., throughout the year. Th, 3-5.

## \*222A-222B. Introduction to Latin Palaeography and Diplomatics.

(PAETOW)

The practical exercises in this course will be done mainly with facsimiles of manuscripts of the twelfth and thirteenth centuries.

2 hrs., throughout the year.

## 241A-241B. Modern European History.

(STEPHENS)

2 hrs., throughout the year, to be arranged.

## \*242A-242B. The French Revolutionary Period in Europe. (STEPHENS)

The same lectures as in course 143A-143B, with additional work for graduate credit.

2 hrs., throughout the year.

## \*243A-243B. The Napoleonic Period in Europe.

(STEPHENS)

The same lectures as in course 143A-143B, with additional work for graduate credit.

2 hrs., throughout the year. Tu Th, 2.

## 251A-251B. Studies in Early English Institutions.

(MORRIS)

For 1918-19 the subject will be: English kingship in the Norman and Angevin periods, 1066-1215.

2 hrs., throughout the year. W, 4-6.

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\*Not to be given, 1918-19.

- \*255A-255B. History of the British Empire. (STEPHENS)  
The same lectures as in course 155A-155B, with additional work for graduate credit.  
2 hrs., throughout the year. Tu Th, 2.
- \*261A-261B. History of Spain and Portugal. (CHAPMAN)  
2 hrs., throughout the year.
- 262A-262B. History of Hispanic America. (CHAPMAN)  
For 1918-19 the subject will be: The relations of the United States and Hispanic America.  
2 hrs., throughout the year. Tu, 7:30-9:30 p.m.
- 265A-265B. Hispanic-American Institutions. (PRIESTLEY)  
1918-19 the subject will be: The transition from colonial to republican forms in the institutions of Mexico to 1857.  
2 hrs., throughout the year. M, 7:30-9:30 p.m.
- 271A-271B. American History. (McCORMAC)  
For 1918-19 the subject will be: The administrations of Tyler and Polk.  
2 hrs., throughout the year. Tu, 1-3.
- 281A-281B. The Southwest under Spain. (BOLTON)  
2 hrs., throughout the year, to be arranged.
- 282A-282B. The Trans-Mississippi West since 1821. (BOLTON)  
2 hrs., throughout the year. Th, 7:30-9:30 p.m.
- \*289A-289B. California History. (CHAPMAN)  
2 hrs., throughout the year.

## TEACHERS' COURSE

301. The Teaching of History. (MORRIS)  
A discussion of the teaching of history in secondary schools, with special reports and criticisms of text-books.  
3 hrs., either half-year. M W, alt. F, 11.

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\*Not to be given, 1918-19.

**HOME ECONOMICS**

MARY F. PATTERSON, Associate Professor of Household Art.

AGNES FAY MORGAN, Ph.D., Assistant Professor of Household Science.

JOSEPHINE DAVIS WHARTON, M.A., Assistant Professor of Household Science.

JOHN W. GILMORE, M.S., Professor of Agronomy.

ETHEL E. TAYLOR, B.S., Instructor in Textiles.

HELEN W. FANCHER, Instructor in Household Art.

ANNA WALLER WILLIAMS, M.A., Instructor in Household Science.

ALICE METCALF, A.B., Assistant in Household Science.

ELIZABETH BRIDGE, M.A., Assistant in Household Science.

EVALINE P. CUTLER, Director of Red Cross Work.

Two distinct courses of study are offered under the general head of Home Economics, one in Household Art and the other in Household Science. These two courses may be combined by the individual student with the consent of the department. Such a combination is often impracticable, however, on account of the prerequisite drawing and design on the one hand and the prerequisite chemistry on the other. Students who wish to enter upon either of these courses of study or upon a combination of the two are urged to include in their work for matriculation, elementary chemistry, freehand drawing, cooking, and sewing as described under subjects 12b, 16, and 18 in the Circular of Information, Academic Departments.

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**HOUSEHOLD ART**

Students who intend to do advanced work in household art should have completed matriculation subjects 18c and 18e, or their equivalents, and botany and chemistry. Lower division work at the University should include History 1A-1B; Economics 1A-1B; Graphic Art 6. Courses recommended: Household Art 1A-1B; Chemistry 1A-1B; Graphic Art 7 and 14A-14B; Drawing 9; Architecture 5; Political Science 1A, 1B. Students who intend to specialize in house furnishing should take in addition Drawing CD; Drawing 3A, 3B, and 3C are recommended. Such a course of study precedes training in the upper division for specialization in costume design and house furnishing.

*Honor-students in the Upper Division.*—Requirements for candidacy for honors in household art at graduation are as follows:

1. The creditable completion of 24 units of major work approved by the department.

2. The continuance of the honor-status, and the privileges and opportunities offered to candidates thereby, depends upon the ability of the



student to do original and independent work and upon the maintenance of a high standard in all courses as well as in the special honor-work undertaken.

A reading knowledge of French, Italian, or German is most desirable. The artistic, historic, and economic aspects of "clothing" and "shelter" are possible fields for study. These fields may include the study of all types of decorative and applied art, the materials used, and their past and present mode of manufacture, whether by hand or machine processes. Such research is admirable as a basis for graduate work leading toward a master's degree.

### LOWER DIVISION COURSES

#### 1A-1B. Clothing.

(PATTERSON and FANCHER)

The evolution of typical forms in clothing; the simplification or standardization of dress individualized by color and decorative features; uniforms for women in war industries and public service; the construction, care, and renovation of garments, especially for civilian and war relief in accordance with Red Cross specifications; a brief survey of textile fibres (cotton, flax, silk, and wool); the conservation of those needed for war purposes and the substitution of others.

7 hrs., throughout the year; 3 units each half-year. Lectures, Th, 4; laboratory: Clothing construction, Sec. I, Tu, 1-4; Sec. II, W, 1-4; Sec. III, Th, 1-4. Decorative needlework, M or F, 1-4. Materials to be furnished by students. Laboratory fee, \$1.50.

#### 5. Red Cross Supplies.

(CUTLER)

Students will elect either (a) sewing—hospital garments, children's clothing, or (b) the making of surgical dressings. All work will be done according to the specifications and subject to the inspection of the American Red Cross.

4 hrs., throughout the year; 1 unit each half-year. Hours to be arranged.

### UPPER DIVISION MAJOR COURSES

NOTE.—With course 194A-194B it is strongly recommended that parallel courses be chosen from the following group: Graphic Art 114A-114B, 127A-127B, 128A-128B. Students who intend to enter the Seminar in Costume Design, 294A-294B, should normally complete these courses, and 193A-193B, 194A-194B, 197 and 198.

#### 193A-193B. The History of Costume.

(PATTERSON)

Costume as pictured in the art of all ages, with a background of contemporary historical periods. Lectures illustrated with stereopticon. Students will be required to make a style book and a fee of \$4 each half-year will be charged for the photographs so used.

3 hrs., throughout the year; 1 unit each half-year. Tu, 1-4. Prerequisite: History 1A-1B.

- 194A-194B. The History of Costume. Laboratory Course. (PATTERSON)  
 Rendering of stuffs in pencil and color; original problems; analysis of styles from photographs and reproductions.  
 3 hrs., throughout the year; 1 unit each half-year. Tu, 1-4. Prerequisite: Graphic Art 6, or equivalent. Course 193A-193B is required concurrently. Graphic Art 7 and 14A-14B are recommended.
- \*195A-195B. House Furnishing. (PATTERSON)  
 4 hrs., throughout the year; 2 units each half-year. Lectures, M, 11; laboratory, M, 1-4. Prerequisite: Drawing CD, History 1A-1B. Architecture 110, Civil Engineering 125, and Household Art 160 and 198 should, if possible precede or parallel this.
196. Teachers' Course. (TAYLOR)  
 Lectures and discussion of methods.  
 2 hrs., first half-year; 2 units. Tu Th, 1. Conferences to be arranged. Prerequisite: senior standing.
- 197A-197B. Review and Discussion of Technique by Practical Problems. (TAYLOR)  
 6 hrs., throughout the year; 2 units each half-year. W F, 1-4. Prerequisite: approved high school courses in matriculation subjects 18c and 18e, or their equivalents, and course 198, or equivalent. Laboratory fee, \$1.50. Materials to be furnished by students. Recommended to be taken concurrently with course 196.
122. Textile Raw Materials. (GILMORE)  
 Fibres of commerce, and those with commercial possibilities; the physical and chemical qualities and characteristics of fibres and their preparation for use on filatures, cordage and fabrics. Lectures and demonstrations.  
 2 hrs., second half-year. Tu Th, 9. Prerequisite: matriculation chemistry and botany.
198. Textiles. (TAYLOR)  
 Evolution of the textile industries, manufacture of fabrics, analysis of fibres and fabrics, costs, weaving.  
 8 hrs., first half-year; 4 units. Lectures, Tu Th, 9; laboratory, W F, 1-4. Prerequisite: course 122, Economics 1A-1B. Laboratory fee, \$2.50, covers cost of materials used for analysis, textile samples and warp for weaving. Wool materials to be furnished by students.
160. House Management. (TAYLOR)  
 Efficiency, service, convenience, economy, as applied in the house or institution. Lectures and discussions.  
 2 hrs., second half-year; 2 units. Tu Th, 9. Prerequisite: matriculation subject 18e or equivalent, Economics 1A-1B.

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\*Not to be given, 1918-19.

## 199. Honor-Course.

(The Staff)

Special reading will be assigned individually, according to the interest and preference of the student, and frequent conferences with the instructor will be arranged.

Credit, not to exceed 2 units either half-year, will be determined in advance for each student.

## GRADUATE COURSES

**The Practice of Teaching.**

Opportunity for practice teaching under the direction of Miss Taylor will be available either half-year in connection with Education 201. Prerequisite or parallel: course 196.

## 294A-294B. Seminar in Costume Design.

(PATTERSON)

(A) Original design in materials and color drawings for modern costumes. (B) Period costumes, accompanied by historical research. Materials to be furnished by the students.

6 hrs., throughout the year; 3 units each half-year. W, 9-12; F, 8-11. Outside reading required.

## 297. Advanced Study.

(PATTERSON)

Hours to be arranged.

Allied courses which may be taken as major work in household art, with the consent of the department.

Graphic Art 114. (Advanced work in Freehand Drawing.) (JUDSON)

Graphic Art 117. (Advanced Color Study.) (NEUHAUS)

Graphic Art 118. (Advanced Design.) (NEUHAUS)

Graphic Art 127, 128. (Art Anatomy.) (NAHL)

Architecture 110. (Housing.) (HAYS)

Economics 182. (The Household as an Economic Agent.) (PEIXOTTO)

Civil Engineering 125. (Plumbing, Heating, Ventilating, and Lighting.) (LANGELIER)

## HOUSEHOLD SCIENCE

Students who wish to do advanced work in household science should have completed matriculation subject 18*d*. Courses in cooking are not offered in the fall or spring sessions of the University; they may, however, be taken during the summer session. The lower division requirements are Chemistry 1A-1B, 5, 8, Economics 1A-1B; Bacteriology 1, Physiology 1, are strongly recommended. Such a course of study precedes training in the upper division for specialization in food economics or dietetics.

*Honor-students in the Upper Division.*—Students who are eligible for the honor-status are urged to enroll at the beginning of their third or junior year. The recommended sequence of courses for such students is as follows: third year, course 101A-101B, Biochemistry 101; fourth year, 120A-120B, 125 or 130, 199A-199B. Honors at graduation are awarded only on the completion of 24 units of major work, and maintenance of the honor-status is dependent upon the attainment of consistently satisfactory grades in other subjects, and of high credit in household science courses.

*Laboratory fees.*—Courses 127, 130, 102, require a laboratory fee of \$5, of which \$2.50 is regarded as a deposit against breakage, the remainder after requisite deductions to be returned to the student at the end of the course.

Courses 101A-101B, 120A-120B, 125, require a laboratory fee of \$10 of which \$5 is regarded as a deposit against breakage, and subject to the conditions mentioned above.

## LOWER DIVISION COURSE

## 1A-1B. The Food Problem.

(The Staff)

An outline of the field of food economics and nutrition designed to meet the needs of the general student in war time and intended to develop intelligent support of practical conservation and national food control. Open to all students without prerequisite.

4 hrs., throughout the year; 3 units each half-year. Lectures, M W, 11; laboratory, Sec. I, M, 1-3; Sec. II, W, 3-5; Sec. III, Tu, 8-10; Sec. IV, Th, 10-12; Sec. V, F, 9-11; Sec. VI, Th, 2-4.

## UPPER DIVISION MAJOR COURSES

## 101A-101B. Food Economics.

The composition, production, transportation, and preservation of common foods with reference to public economy and conservation; individual selection and preparation of such food with reference to hygiene, nutritive value, flavor, and cost; an introduction to quantitative methods in food analysis.

8 hrs., throughout the year; 4 units each half-year. Lectures, Tu Th, 9; laboratory or field work, Tu, 2-5; S, 9-12. Prerequisite: Chemistry 1A-1B, 8A-8B, 5, matriculation subject 18*d* (4 units).

## 102. Food and Dietetics.

(METCALF)

Designed to meet the needs of students planning to take nurses' training. A brief survey of food economics, including food preparation, and the field of normal and abnormal nutrition; practice in the making of dietaries; calculation and preparation of special diets, and milk formulae.

8 hrs., second half-year; 4 units. Lectures, M W, 11; laboratory, W F, 1-4. Prerequisite: Chemistry 1A-1B and at least junior standing.

## 120A-120B. Dietetics.

(MORGAN)

The quantitative basis of dietetics established through typical experiments in food analysis and calorimetry, digestion experiments, respiration and dietary records, nitrogen and mineral balances; the chemistry and physiology of digestion and metabolism with emphasis upon energy relations; the application of these principles to practical feeding problems of the individual and the group.

8 hrs., throughout the year; 4 units each half-year. Lecture, Tu Th, 11; laboratory, M W, 8-11. Prerequisite: Chemistry 5; course 101A-101B, or Biochemistry 101 (5 units).

## 125. Quantitative Experimental Cookery.

(WILLIAMS)

Practice in food preparation under controlled conditions; quantitative analysis of the materials and products with special reference to war-time problems. This course is preparatory to research work in food and nutrition.

7 hrs., first half-year; 3 units. Lectures, Tu, 8; laboratory, W Th, 1-4. Prerequisite: course 101A-101B; Chemistry 5.

## 126. Methods of Teaching Household Science.

(WHARTON)

Study of suitable equipment for teaching household science in elementary and secondary schools; planning of courses, and of single lessons; observations of classes; practice in public demonstrations of food preparation and classification.

4 hrs., first half-year; 2 units. Tu, 1, F, 1-4. Prerequisite: course 120A-120B, and at least 3 units of education.

## 127. Elementary Food Course for Advanced Students.

(WHARTON)

A critical and constructive review of technique for students planning to teach cooking in the secondary schools. Open only to candidates for the teacher's recommendation offering a major or minor in household science.

6 hrs., second half-year; 2 units. M W, 1-4.

## 130. The Nutrition of Development.

(MORGAN)

The chemistry and physiology of ovulation, intra-uterine development, lactation, and growth; normal and subnormal nutrition in infancy and childhood; practice in the solution of feeding problems; clinic and follow-up work are included.

5 hrs., second half-year; 3 units. Lectures, Tu Th, 9; laboratory, Th, 2-5. Prerequisite: course 120A, or Biochemistry 101.

## 199A-199B, Honor-Course.

(The STAFF)

Open only to candidates for honors; guidance for honor-students in the prosecution of special reading, laboratory or field work.

2 hrs., throughout the year, to be arranged.

## GRADUATE COURSES

## The Practice of Teaching Household Science.

Opportunity for practice teaching under the direction of Mrs. Wharton will be available either half-year in connection with Education 201. Prerequisite or parallel: course 126.

## 214. Research.

(MORGAN)

The principles and methods of physical and biological chemistry applied to the investigation of problems concerned with food preparation and metabolism.

Hours and topics to be arranged either half-year.

## 215. Special Studies.

(The STAFF)

Hours and topics to be arranged, either half-year.

## 216. Seminar.

(MORGAN)

Recent advances in the chemistry of food and nutrition, metabolism, food economics, and dietetic therapy.

2 hrs., first half-year; 2 units. F, 9-11.

**HYGIENE**

- ROBERT T. LEGGE, Ph.G., M.D., F.A.C.S., Professor of Hygiene and University Physician.
- <sup>1</sup>JOHN N. FORCE, M.D., M.S., Gr.P.H., Assistant Professor of Epidemiology; Lecturer in Preventive Medicine and Hygiene in the Medical School.
- ROMILDA P. MEADS, B.S., M.D., Assistant Professor of Hygiene and Physician for Women.
- FRANK L. KELLY, M.D., Gr.P.H., Acting Director, Bureau of Communicable Diseases, State Hygienic Laboratory.
- <sup>1</sup>ALBERT M. MEADS, B.S., M.D., University Physician and Lecturer in Hygiene.
- CLARK BURNHAM, M.D., Surgeon in the Infirmary.
- ROBERT N. HOYT, B.S., District Health Officer, California Board of Health; Lecturer in Public Health.
- KATE GOMPERTZ, B.S., M.D., Physician for Women.
- <sup>1</sup>MILTON H. SHUTES, A.B., M.D., Ophthalmologist.
- RUTH RISDON STORER, B.S., M.D., Assistant Physician for Women.
- CHARLES L. MCVEY, A.B., M.D., Acting Physician for Men.
- RUBY L. CUNNINGHAM, M.D., M.S., Instructor in Hygiene and Assistant Physician for Women.
- JESSE W. CALKINS, A.B., M.D., Ophthalmologist.
- PERCIVAL L. ANSELL, Roentgenologist.
- CHARLES W. CRAIG, D.D.S., Dental Surgeon.
- MURRAY H. GROVES, D.D.S., Dental Surgeon.
- LAURA CAIRNS, M.S., Assistant in Hygiene.
- IDA MAY STEVENS, M.A., Chief Bacteriologist, State Hygienic Laboratory.
- ANNETTE STUART, Assistant in Hygiene.
- ETHEL SHERMAN, Superintendent of Infirmary.

Laboratory fees are \$5 for courses 102 and 108; \$5 additional deposit is required in each laboratory course and will be refunded, less deduction for breakage, at the end of the half-year.

*Professional Course in Public Health.*—The professional course in public health comprises a curriculum in medicine, sanitary engineering, hygiene, economics, political science, veterinary science, entomology, zoology, and nutrition, the completion of which leads to the degree of Graduate in Public Health (Gr.P.H.). For details of the curriculum the student is referred to the Circular of Information, Academic Departments.

<sup>1</sup> Absent on leave, for the duration of the war.

*Honor-students in the Upper Division.*—Students in the honor-group may receive honors at graduation either

1. Upon presenting a satisfactory report on a field investigation of a public health activity, or,
2. Upon a thesis based on a laboratory investigation, or,
3. Upon the completion of a course of reading on a special topic in public health.

Candidates for honors must prepare a programme at the beginning of their candidacy in consultation with the Committee on Public Health Study-Lists. In most cases the junior year will be spent in preliminary reading. In the senior year, those students who desire to take honors on the basis of reading alone will prepare for a final oral examination; while those who desire to engage in laboratory or field investigations will prepare a thesis or report embodying their results.

The committee will recommend the exclusion from the honor-group of all students who do not maintain each half-year an average of at least 60 per cent of first and second grades in all their courses and who do not complete their courses in public health with high credit.

Candidates must complete 30 units in courses chosen from the first two years of curriculum A in Public Health.

Teachers' recommendations: For information concerning the major in Hygiene, see the Announcement of the School of Education. No minor in Hygiene will be granted except to students who have completed Chemistry 1A-1B, and Bacteriology 1.

### LOWER DIVISION COURSES

1. Principles of Hygiene and Sanitation. (LEGGE)  
Lectures, readings, and recitations.  
2 hrs., first half-year. Tu Th, 8. Prescribed for all undergraduate men during their first year of residence.
2. Essentials of Personal and Public Hygiene. (MEADS)  
Lectures, readings, and recitations.  
2 hrs., first half-year. M W, 11. Prescribed for all undergraduate women during their first year of residence.
3. Elementary Epidemiology. (CUNNINGHAM)  
Communicable diseases now prevalent in California; their control through individual and community endeavor. General problems of food, water, insect, contact, and carrier control. Lectures, readings, recitations, and papers.  
3 hrs., first half-year. M W F, 10.



## FREE ELECTIVE COURSES

4. Domestic Hygiene. (CAIRNS)  
Lectures on home sanitation. Primarily for students in home economics.  
2 hrs., first half-year. Tu Th, 11.
5. First Aid. (MEADS, GOMPERTZ, STORER, CUNNINGHAM, CAIRNS)  
A course for women in the recognition and treatment of common accidents, with special emphasis upon conditions peculiar to children.  
2 hrs., second half-year. Sec. I, Tu Th, 9; II, Tu Th, 10; III, Tu Th, 2.
6. Industrial Hygiene. (LEGGE)  
For engineering, commerce, and forestry students. General problems in the control of epidemic and occupational diseases. The sanitation of labor camps and factories, accident prevention, employees' welfare and compensation laws. Lectures, recitations, papers, and field surveys.  
2 hrs., second half-year. M W, 11.
7. First Aid. (McVEY)  
A course for men in the recognition and emergency treatment of common accidents. Class limited to eighty.  
2 hrs., second half-year; 1 unit. Tu Th, 10.
8. Mine Sanitation. (LEGGE)  
Sanitation of mines; methods of rescue and accident treatment.  
1 hr., second half-year, to be arranged.
9. Home Care of the Sick. (———)  
A course for women, in general therapeutic measures of use in caring for invalids at home.  
2 hrs., second half-year; 1 unit. Hours to be arranged.

## UPPER DIVISION MAJOR COURSES

101. Child Hygiene. (LEGGE)  
Primarily for students who intend to become teachers, but open also to students of economics. The hygiene of early child life; the cause and prevention of infant mortality; health supervision of school children and the practical sanitation of schools. Lectures, readings, recitations, papers, and field assignments.  
3 hrs., second half-year. M W F, 10.

## 102. The Teaching of Hygiene.

(CAIRNS, STUART)

A laboratory course in methods of presenting the elements of hygiene and sanitation to children in graded schools. Primarily for persons preparing to teach hygiene.

6 hrs., first half-year; 2 units. Sec. I, Tu Th, 8-11; II, Tu Th, 1-4.

## 104. Health Surveys.

(—)

Lectures, readings, individual reports and class field assignments on public health administration and procedures.

5 hrs., second half-year; 3 units. M W, 9; S, 9-12. Prerequisite: Bacteriology 1 and Chemistry 1A-1B.

## 107. Advanced Epidemiology.

(—)

Lectures, readings, and individual reports on communicable diseases.

3 hrs., first half-year. M W F, 9. Prerequisite: Bacteriology 1 and Chemistry 1A-1B.

## 108A-108B. Public Health Laboratory.

(STUART)

Instruction in standard methods of examination of air, water, and milk. Laboratory practice in the detection of communicable diseases.

9 hrs., throughout the year; 3 units each half-year. M W F, 1-4. Prerequisite: Bacteriology 1 and Chemistry 1A-1B.

## GRADUATE COURSE

## 201. Research in Hygiene.

(STUART)

Special problems worked out in the field or in the laboratory of hygiene. Credit value to be fixed in each case.

**IRRIGATION**

BERNARD A. ETCHEVERRY, B.S., Professor of Irrigation Engineering.

SIDNEY T. HARDING, B.S., Associate Professor of Irrigation.

Courses 101, 102A, 102B, 103, 104, and 112 are designed to meet the needs of engineering students who wish to make a specialty of irrigation. They appear as part of the course in Irrigation Engineering in the College of Civil Engineering. Courses 101, 104, 105A, 105B, 113, and 115 are designed for students in the College of Agriculture. Courses 101, 103, 113, are also open to other students who have junior standing.

Students will be recommended for honors on the same basis as in civil engineering.

**UPPER DIVISION MAJOR COURSES**

101. Irrigation Institutions and Economics. (HARDING)  
Water rights, irrigation institutions and organizations.  
3 hrs., second half-year. Sec. I, M W F, 10, for engineering students only; Sec. II, M W F, 8, open to non-engineering students. Prerequisite: course 103 or 113.
- 102A. Irrigation Engineering. (ETCHEVERRY)  
Investigation and general planning of irrigation systems; conveyance of water; silt problems; design of canals, tunnels, flumes, pipelines, inverted siphons.  
2 hrs., second half-year. Tu Th, 8. Prerequisite: Civil Engineering 110 or Mechanical Engineering 103A.
- 102B. Irrigation Engineering. (ETCHEVERRY)  
Principles of design of diversion weirs, headworks, wasteways, sand boxes, falls, checkgates, laterals, headgates, road crossings, special types of distribution systems, measuring devices.  
2 hrs., first half-year. Tu Th, 9. Prerequisite: course 102A.
103. Agricultural Use of Water and Irrigation Practice. (ETCHEVERRY)  
Sources of water supply; disposal of irrigation water applied to the soil; water requirement of crops; duty of water; preparation of land and methods of irrigation; small pumping plants.  
2 hrs., first half-year; 2 units. Tu Th, 11. For engineering students, but open to other students excepting those in the College of Agriculture, for whom course 113 is offered. Prerequisite: junior standing.
104. Drainage. (ETCHEVERRY)  
The structure of soils and its relation to drainage; planning of drainage systems for overflow, waterlogged and alkali lands; organization of drainage districts.  
2 hrs., second half-year. Tu Th, 9. Prerequisite: junior standing.

**105A. Agricultural Hydraulics and Elements of Irrigation Engineering.**

(ETCHEVERRY)

Principles of hydraulics as applied to irrigation systems. The elements of irrigation projects; the conveyance of water in canals, tunnels, flumes, and pipe-lines.

5 hrs., second half-year; 3 units. Tu Th, 10; W, 1-4. Open to students in the College of Agriculture. Not open to students who receive credit for course 102A. Prerequisite: Civil Engineering 1.

**105B. Agricultural Hydraulics and Elements of Irrigation Engineering.**

(ETCHEVERRY)

Irrigation structures, their function and proportions; systems of distribution; measurement of water and measuring devices.

2 hrs., first half-year. Tu Th, 8. Prerequisite: course 105A.

**112. Irrigation Design.**

(ETCHEVERRY)

The design of structures such as flumes, drops, inverted siphons, and headgates, with estimates of cost.

6 or 9 hrs., first half-year; 2 or 3 units. Tu Th, 1-4. Prerequisite: course 102, Civil Engineering 108A-108B.

**113. Agricultural Use of Water and Irrigation Practice.**

(HARDING)

Soil moisture and plant growth; disposal of irrigation water applied to the soil; water requirement of crops; duty of water: preparation of land and methods of irrigation; farm ditches and structures; small pumping plants; measurement of water.

3 hrs., first half-year; 3 units. Three sections: I, Tu Th S, 9; II, Tu Th S, 10; III, Tu Th S, 11. For students in the College of Agriculture, but open to other students. Prerequisite: junior standing.

**115. Irrigation Drawing.**

(HARDING)

Drawing and making estimates of typical irrigation structures as used on the farm.

6 hrs., first half-year; 2 or 3 units. Tu Th, 1-4. For students in the College of Agriculture. Prerequisite: course 105.

**119. Undergraduate Thesis Course.**

2 units, either half-year.

**GRADUATE COURSES****202. Advanced Irrigation Design.**

(ETCHEVERRY)

6 hrs., second half-year; 2 units. Prerequisite: course 112. Open to specially prepared seniors.

**207. Operation and Maintenance of Irrigation Systems.**

(HARDING)

2 hrs., first half-year. Prerequisite: courses 113 and 105 for agricultural students; courses 103 and 102 for engineering students. Open to specially prepared seniors.

**208. Seminar in Irrigation.**

(ETCHEVERRY, HARDING)

Conferences on topics concerning the development of irrigation industry. Hours to be arranged. Open to specially prepared seniors.

**ITALIAN****LOWER DIVISION COURSES****AB-CD. Elementary Italian.**

Essentials of grammar. Short stories by contemporary writers.  
5 hrs., throughout the year. M Tu W Th F, 8.

**E-F. Intermediate Italian.**

A detailed study of syntax; dictation and memorizing of prose and verse; conversation; selections from modern texts.  
3 hrs., throughout the year. M W F, 9. Prerequisite: course AB-CD.

**UPPER DIVISION MAJOR COURSES****103A-103B. The Nineteenth Century.**

A detailed study of standard authors, prose and verse, with dictation and reports on assigned themes.  
3 hrs., throughout the year. M W F, 10. Prerequisite: course E-F, or its equivalent, or a special examination.

**\*105A-105B. The Fifteenth and Sixteenth Centuries.**

A study of the chief writers of this period, with lectures and reports by the students.  
2 hrs., throughout the year, to be arranged.

**107A-107B. A Survey of Italian Literature.**

A study of the principal writers with selections from their most important works.  
2 hrs., throughout the year. Tu Th, 11.

**GRADUATE COURSE****\*201A-201B. Dante, Petrarch, and Boccaccio.**

2 hrs., throughout the year, to be arranged.

**205A-205B. The Civilization of Modern Italy.**

2 hrs., throughout the year. S, 9-11.

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\*Not to be given, 1918-19.

**JURISPRUDENCE**

**WILLIAM CAREY JONES, M.A.,** Professor of Jurisprudence, Director of the School of Jurisprudence.

**ORRIN K. McMURRAY, Ph.B., LL.B.,** Professor of Law.

**CURTIS H. LINDLEY, LL.D.,** Honorary Professor of the Law of Mines and Water.

\***ALEXANDER M. KIDD, A.B., LL.B.,** Professor of Law.

**EDWARD ELLIOTT, Ph.D.,** Professor of International Law and Politics.

**FRANCIS S. PHILBRICK, Ph.D., LL.B.,** Professor of Law.

\***MATTHEW C. LYNCH, B.L., J.D.,** Professor of Law.

**AUSTIN T. WRIGHT, A.B., LL.B.,** Professor of Law.

**LESLIE J. AYER, B.S., J.D.,** Professor of Law.

\***FAENHAM P. GRIFFITHS, B.L., A.B.,** Lecturer in Law.

\***ARTHUR G. TASHEIRA, A.B., LL.B.,** Lecturer in Law.

**WILLIAM E. COLBY, LL.B.,** Lecturer in Law of Mines and Water.

**MAURICE E. HARRISON, A.B., J.D.,** Lecturer in Law.

\***ALLAN P. MATTHEW, A.B., LL.B.,** Lecturer on the Law of Public Utilities.

\***JOHN U. CALKINS, JR., B.L., J.D.,** Lecturer in Commercial Law.

\***HERMAN H. PHLEGER, B.S.,** Lecturer in Law.

**ERNEST B. HOAG, M.A., M.D.,** Lecturer in Criminology.

**SCOPE OF THE SCHOOL OF JURISPRUDENCE**

The design of the School of Jurisprudence is to furnish instruction, whether historical, theoretical, or practical, in the whole orbit of law, international, public, and private. On the historical and theoretical side it offers courses in comparative law, Roman law, jurisprudence, or the theory of law, and on various topics in the history of the common law.

On the practical side, it offers a complete professional curriculum, based on at least three years of academic training. The main body of this curriculum is of general application, constituting a preparation for the practice of law in any jurisdiction founded on the common law. At the same time, emphasis is given to courses which direct attention to local legal conditions and practice in the Western states such as mining law, water law, and code procedure. The case method of instruction is used in the professional courses.

**BOALT HALL OF LAW**

The School of Jurisprudence occupies the Boalt Memorial Hall of Law, a building designed exclusively for purposes of legal instruction. It was erected through the generosity of the late Mrs. Elizabeth Boalt, supplemented by subscriptions from California lawyers, as a memorial to her husband, the late John H. Boalt.

\*Absent on leave, 1918-19.

\*Absent on leave for the duration of the war.

*Law Library.*—The law library contains a valuable collection of over twenty thousand volumes, and is being constantly extended and improved. It is conveniently placed in connection with the reading room in Boalt Hall of Law.

*Law Library Fee.*—A law library fee of \$12.50 each half-year is charged all students, regular and special, who are registered in more than one professional course in law. All money accruing from such fees are devoted to the purchase of books for the law library of the School of Jurisprudence.

*Admission to the Professional Curriculum.*—The following persons will be admitted without examination, as candidates for the degree of Juris Doctor: (1) graduates of any college of the University of California, and of other colleges and universities of approved grade; (2) students admitted to senior standing in the University of California.

Students who enter the professional curriculum with senior standing may obtain the academic bachelor's degree on the satisfactory completion of the first year of such curriculum, provided that not more than 26 units of professional law work will be counted toward the bachelor's degree.

The student entering the University with the intention of pursuing the course in law is advised to map out his undergraduate curriculum with great care. He is invited to consult members of the School of Jurisprudence in respect thereto.

Any student who has secured the junior certificate and has done one year's additional work in the University, or who, in other words, is ready to enter upon the senior year of the undergraduate course, may take up the regular professional curriculum in law. The course in Roman law and jurisprudence, however, should regularly be taken in the junior year. Among other subjects in law that may also be taken before the undergraduate senior year are elementary law, history of Anglo-American legal institutions, international law, and military law.

The intending student of law who is prepared to do so is advised to enroll in the College of Letters and Science and pursue a full classical curriculum. If such a course is not attainable, the student is advised to take as thorough a course in Latin as possible. Such study will be profitable to him in many ways, and will open up the possibility of scholarly research in civil law and jurisprudence in the graduate years. The attention of the law student is called to the course in elements of law Latin (Latin LA-LB) offered by the department of Latin.

Every student of law should normally pursue a systematic course in history, political science and economics. The department of history has adjusted some of its courses with special reference to the needs of the law students. Under this arrangement, the intending law student is advised to take History 1A-1B, General History, in the freshman year. If he does good work in this subject, he will be admitted, in his sophomore year, to the two junior courses, 151, History of England, and 171, American History. He will then be eligible, in his junior year, to take the two senior courses, 152, English Constitutional History, and 172, American Constitutional History. In political science, he should take, at least, Political Science 1A. In economics, he should take Economics 1A-1B, 101, or 100, and courses in accounting. Having taken these subjects in political science and economics not later than his sophomore year, he will be in a position to elect in his junior year such subjects as municipal

government, political theories, modern industrialism, banking, public finance, railway problems, and other fruitful courses offered by the departments of political science, economics, and history.

The intending student of law is likewise advised to make careful selection of courses in the departments of English and philosophy.

Whatever direction the student's pre-legal training may take, whether in history, letters, pure science, or applied science, the importance cannot be too strongly impressed upon him of pursuing systematic and thorough courses in one or two departments rather than of making up a curriculum of fragmentary and unrelated subjects in a number of departments.

#### MOOT COURTS

Students in the first year of the professional course are expected to prepare and argue several cases in the moot courts during the year. Second-year and third-year students supervise and assist in this work. Special sessions of these courts are planned so that third-year students taking the courses in evidence and practice may conduct the trials of cases which are specially prepared.

#### FURTHER INFORMATION

For fuller information in regard to the law school, consult the annual Announcement of the School of Jurisprudence.

#### LOWER DIVISION COURSES

##### 10A-10B. Elementary Law.

(PHILBRICK)

The general principles of the law. Students who intend to continue the study of law are advised to take this course in their sophomore year.

2 hrs., throughout the year. Tu Th, 11.

##### 18A-18B. Commercial Law.

(AYER)

For students in the College of Commerce. Students who intend to pursue the professional curriculum are advised ordinarily not to take this course.

2 hrs., first half-year. M W, 8; 3 hrs., second half-year, M W F, 8.

#### UPPER DIVISION MAJOR COURSES

##### 101. Military Law.

(WRIGHT)

The rules of land warfare, the rights and liabilities of military persons in civil tribunals; martial law and court-martial, briefly considered. Open to upper division students. Graduate credit to candidates for the J.D. degree on the completion of extra requirements.

2 hrs., either half-year. Tu Th, 11.



- 103A-103B. Principles of International Law. (ELLIOTT)  
The general principles of international public law; use of standard texts, illustrated documents and cases.

2 hrs., throughout the year. M W, 10.

- 105A-105B. Roman Law: Jurisprudence. (PHILBRICK)  
History of the development of the public and private law of the Romans; systematic and historical exposition of Roman law, with comparative views of the chief modern systems; the science of positive law.

2 hrs., throughout the year. Tu Th, 8. The student is advised to take this course in the junior year. Required for the major in jurisprudence and for the degree of J.D. Course 105A is prerequisite to course 105B, except that instead of course 105A students may take Latin 121 (see below).

- Elementary Roman Law. [See Latin 121.] (MERRILL)  
The Institutes of Justinian.

3 hrs., first half-year. M W F, 9.

- Greek Law. [See Greek 153.] (CALHOUN)  
2 hrs., second half-year.

107. Anglo-American Legal Institutions. (MCMURRAY)  
An historical survey of the principal English and American legal institutions. For students of law in their junior year.

2 hrs., first half-year. Tu Th, 9.

- 118A-118B. Advanced Commercial Law. (———)  
The study of cases of principal importance. For senior students in the College of Commerce, but open to other upper division students with the consent of the instructor. Credit in this course cannot be applied toward the total units of law required for the J.D. degree.

2 hrs., first half-year, Tu Th, 8; 3 hrs., second half-year, Tu Th S, 8.

- Public Law of Modern European States. [See Political Science 116.] (EHRlich)

- \*109. School Legislation of California. (JONES)  
An interpretative and critical study of California school law as a resultant of social and political conditions and forces.

2 hrs., second half-year.

\*Not to be given, 1918-19.

## COURSES IN CRIMINOLOGY

102. Medical and Psychological Problems. (HOAG)  
An introduction to the study of the medical and psychological side of criminology, including mental disorders, feeble-mindedness, disease, heredity, organization of departments for the study of criminals. Lectures and assigned reading.  
2 hrs., first half-year. Tu Th, 11. Open to upper division students in all departments.
104. Juvenile Delinquency. (HOAG)  
Causes, treatment, and prevention of juvenile delinquency. Case histories; methods of making physical and mental examinations; obtaining family histories; developmental histories; heredity charts, their interpretation; relation of the school to the recognition of potential delinquency and preventive work; clinical work with actual cases.  
3 hrs., first half-year. M W F, 9. Open to upper division students in all departments.
106. Clinical Criminology: Practice Work. (HOAG)  
Study of individual cases. Use of various intelligence tests and psychiatric methods. Case-history studies; police and intelligence methods and administration.  
4 hrs., first half-year; 2 units. Tu Th, 9-11. Open to upper division students specially qualified by training or experience.

## THE PROFESSIONAL CURRICULUM

*First Year*

- 111A-111B. The Law of Property I. (a) Personal Property; (b) Introduction to Real Property. (McMURRAY)  
3 hrs., throughout the year. M W F, 9.
- 112A-112B. The Law of Torts. (JONES)  
3 hrs., first half-year; Tu Th, 10, F, 8. 2 hrs., second half-year. Tu Th, 10.
113. Criminal Law and Procedure. (WRIGHT)  
4 hrs., first half-year. M W, 8; Tu Th, 9.
- 115A-115B. The Law of Contracts. (AYER)  
3 hrs., throughout the year. M W F, 10.
119. Common Law Procedure. (WRIGHT)  
1 hr., second half-year. F, 8.

120. Law of Associations I. (Agency.) (WRIGHT)  
2 hrs., second half-year. Tu Th, 9.

122. Equity I. (PHILBRICK)  
2 hrs., second half-year. M W, 8.

## GRADUATE COURSES

NOTE.—While all the courses in the second and third years are elective, they are distributed by years and are so arranged on the schedule of exercises. The student is advised to observe this arrangement by years, so as to secure the advantage of proper sequence of study and avoid conflict in hours of lecture.

*Second Year*

\*217. The Law of Property II. (a) Conveyances; (b) Wills and Administration. (McMURRAY)

3 hrs., throughout the year.

202. Constitutional Law. (JONES)  
2 hrs., throughout the year. Tu Th, 9.

\*225. Law of Associations II. Agency, Partnership, Corporations. (WRIGHT)  
3 hrs., throughout the year.

227. Equity II. (a) Equity; (b) Trusts. (PHILBRICK, McMURRAY)  
3 hrs., first half-year; M W F, 9. 2 hrs., second half-year, Tu Th, 10.

230. Business Law. (HARRISON)  
Negotiable instruments, mortgages, trust deeds, banking.  
2 hrs., throughout the year. M W, 8.

\*231. The Law of Suretyship. (PHILBRICK)  
2 hrs., first half-year.

235. The Law of Damages. (PHILBRICK)  
2 hrs., second half-year. W F, 11.

216. The Law of Mines I. (COLBY)  
2 hrs., first half-year. Tu Th, 8.

NOTE.—By arrangement, students in the College of Mining may take a portion of this course and receive one unit of credit.

\*Not to be given, 1918-19.

210. The Law of Water. (COLBY)  
2 hrs., second half-year. Tu Th, 8.
- 203A-203B. Seminar in International Law. (ELLIOTT)  
2 hrs., throughout the year. M, 3-5.
270. History of European Law. (PHILBRICK)  
A reading course. Part of the reading to be done by each student will be selected either with general reference to a particular country, or with comparative reference to a general movement in different countries; and part will be selected with comparative reference to the history of a particular branch of law, upon which a paper will be prepared.  
1 hr., first half-year, to be arranged.
275. Modern Juristic Thought. (PHILBRICK)  
A reading course. Books and articles will be assigned for study, and each student will prepare a paper.  
1 hr., second half-year, to be arranged.
- Third Year*
221. The Law of Evidence. (WRIGHT)  
2 hrs., throughout the year. W F, 10.
229. Code Procedure. (HARRISON)  
2 hrs., throughout the year. S, 8-10.
240. Conflict of Laws. (MCMURRAY)  
2 hrs., throughout the year. Tu Th, 11.
224. The Law of Sales. (AYER)  
3 hrs., second half-year. Tu Th F, 9.
- \*226. The Law of Public Service. (MATTHEW)  
2 hrs., throughout the year.
208. The Law of Municipal Corporations. (JONES)  
2 hrs., second half-year. M, 10-12.
243. Insolvency and Bankruptcy. (AYER)  
2 hrs., second half-year. Tu Th, 9.
218. The Law of Mines and Water II. (COLBY)  
Original research upon assigned topics with class reports and criticisms.  
Open to qualified students who have completed course 216 or 210.  
1 hr., either half-year, to be arranged.

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\*Not to be given, 1918-19.

- \*233. Practice. (KIDD)  
2 hrs., second half-year. Tu Th, 10.
209. Anglo-American Jurisprudence. Research course. (PHILBRICK)  
2 hrs., first half-year, to be arranged.
245. Comparative Law. (PHILBRICK)  
Comparative history of selected legal ideas.  
2 hrs., second half-year, to be arranged.
207. Seminar in Roman Law. (JONES)  
2 hrs., first half-year, to be arranged.
244. Admiralty. (WRIGHT)  
2 hrs., first half-year. M W, 11.
254. Seminar in Admiralty and Maritime Law. (WRIGHT)  
2 hrs., second half-year, to be arranged. Prerequisite: course 244.
- \*250. Persons. (WRIGHT)  
2 hrs., first half-year.
- \*251. Quasi Contracts. (PHLEGER)  
2 hrs., second half-year.
- Seminar in the Public Law of Modern European States (see Political Science 209). (EHRlich)

NOTE.—Students who plan to take the law courses in their senior year should have all other college work completed by the end of their junior year.

Students in the College of Commerce who desire to take more than courses 10A–10B, 18A–18B, 118A–118B, and 103A–103B should consult the Director of the School.

Graduate standing implies that the student has credit for courses 105A–105B, 111A–111B, 112A–112B, 113, 115A–115B, 119, 120, 122.

Latin 121 may be included in the advanced work in jurisprudence.

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\*Not to be given, 1918–19.

## LATIN

WILLIAM A. MERRILL, Ph.D., L.H.D., Professor of the Latin Language and Literature.

LEON J. RICHARDSON, A.B., Associate Professor of Latin.

CLIFTON PRICE, Ph.D., Assistant Professor of Latin.

HERBERT C. NUTTING, Ph.D., Assistant Professor of Latin.

OLIVER M. WASHBURN, A.B., Assistant Professor of Classical Archaeology.

MONROE E. DEUTSCH, Ph.D., Assistant Professor of Latin.

TORSTEN PETERSSON, Ph.D., Instructor in Latin.

*College of Letters and Science.*—Students in the Colleges of Letters and Science who have credit for matriculation subject 6 may satisfy any prescription of additional Latin by approved combinations of courses A, B, C, L, 1b, 5b, aggregating 6 units.

Students who are preparing for major work in Latin will find it to their advantage to acquire a reading knowledge of French and German, and to take as much work in Greek and ancient history as may be possible.

*Honor-students in the Upper Division.*—Students in the honor-group whose major subject is Latin may receive honors at graduation by passing a special examination at the end of the senior year, or by maintaining a superior quality of work throughout the course. At the beginning of each half-year they should submit their study-lists for approval to the head of the department. They will then proceed with their work under the supervision of their instructors, attending conferences and making such reports of progress as may be asked for. At the close of each half-year the department will recommend the exclusion from the honor-group of students who have fallen below the standard and the promotion to the group of those whose work merits distinction.

*Courses in Other Departments.*—As part of the 24 units, required of candidates for honors in Latin, major courses in the following subjects will be accepted: Greek, ancient history, Roman law, linguistics, Sanskrit, philosophy, and such major courses in English or foreign languages as deal with literary types. The number and character of acceptable courses will vary with circumstances, and will be decided for each student when his proposed study-list is submitted for approval.

## LOWER DIVISION COURSES

Courses A and B are intended mainly for students who enter with two or three years of preparatory Latin.

B. Third-year Latin, Ciceronian Prose.

(WASHBURN, DEUTSCH, PETERSSON)

3 hrs., either half-year. First half-year, Tu Th S, 9. Second half-year, M W F, 9. Prerequisite: matriculation subject 6. Not open to students who present Cicero at matriculation.

A. Fourth-year Latin, Augustan Poetry.

(NUTTING, PRICE, WASHBURN, DEUTSCH, PETERSSON)

3 hrs., either half-year. Second half-year, Tu Th S, 9. First half-year, M W F, 8, 1. Intended for students who have received credit for course B and also for students who enter with but 9 units of matriculation Latin. Not open to students who present Virgil at matriculation.

LA-LB. Elements of Law Latin.

(MERRILL)

This course is planned for future students of the law.

3 hrs., throughout the year. M W F, 9. Prerequisite: matriculation subject 6. Latin L is not a substitute for Latin 1 or 2.

1. Cicero and Pliny.

(PRICE, WASHBURN and PETERSSON)

The Cato Maior of Cicero and the Letters of Pliny. Systematic study of syntax and synonyms. Practice in reading aloud and in translating at hearing; and in pronunciation, phrasing and emphasis.

3 hrs., either half-year. First half-year, M W F, 9, 10, Tu Th, 10, and a third hour. Second half-year, M W F, 8. Prerequisite: matriculation subjects 7a and 7b or their equivalent.

2. Plautus and Catullus (or Livy).

(PRICE, WASHBURN, PETERSSON)

One play of Plautus; selections from Catullus (or Livy, Hannibalic War).

3 hrs., either half-year. First half-year, M W F, 2. Second half-year, M W F, 9, 10. Prerequisite: course 1.

5. Horace and Virgil.

(RICHARDSON, PRICE, DEUTSCH)

The Odes and Epodes of Horace. Private readings of selections from Virgil's Aeneid, VII-XII.

3 hrs., either half-year. First half-year, M W F, 9, 10. Second half-year, Tu Th, 9, W, 4. Prerequisite: course 2.

COURSES IN SIGHT TRANSLATION

The object of these courses is to gain ability to read, and in some measure to speak, the Latin language. Courses 1B and 5B will be found especially useful to students who have found it necessary to give up the study of Latin in the ordinary courses.

1B. Sight Translation, I.

(DEUTSCH)

Practice in reading at sight from easy authors.

2 hrs., first half-year; 1 unit. Tu Th, 1. Prerequisite: matriculation subject 6. Intended especially for freshmen in any college, but may be taken by more advanced students, in either the lower or upper division, who do not pursue other courses in Latin; or without credit by advanced students in Latin.

## 5B. Sight Translation, II.

(DEUTSCH)

Translation at sight of more difficult Latin, and translation at hearing.

2 hrs., second half-year; 1 unit. Tu Th, 1. Prerequisite: course 5 completed or in progress, or course 1B, or the consent of the instructor. This course may be repeated with credit. Intended especially for sophomores, but may be taken by more advanced students as a free elective, whether pursuing other courses in Latin or not.

## COURSES IN LATIN WRITING, LOWER AND UPPER DIVISION

The object of the courses in Latin writing is, first, training in forms and syntax; later, in idiom, style, and periodology through imitation of classical examples; finally, in original composition.

## CA-CB. Latin Composition, Preliminary Course.

(NUTTING)

1 hr., throughout the year. S, 8. Prerequisite: matriculation subject 6b.

## 3A-3B. Latin Composition, I.

(NUTTING)

Exercises in writing Latin prose narrative.

1 hr., throughout the year. Th, 1, 2. Prerequisite: matriculation subjects 7c<sup>1</sup>, or 7c<sup>2</sup>, or course CA-CB.

## 104A-104B. Latin Composition, II.

(DEUTSCH)

Writing in Latin in periodic style.

1 hr., throughout the year. Tu, 2. Prerequisite: course 3A-3B. Students may be promoted into this course from course 3A-3B at mid-year, in special cases.

## 112A-112B. Latin Composition, III.

(PETERSSON)

Translation of English selections, and of Latin poetry, into Latin prose. Training in Latin expression and construction.

1 hr., throughout the year. Th, 3. Prerequisite: course 104A-104B.

## 113A-113B. Latin Composition, IV.

(MERRILL)

Original Latin essays; practice in narrative and argument.

1 hr., throughout the year, to be arranged. Prerequisite: course 112A-112B.

## 285. Advanced Latin Composition. [See graduate courses.]

## FREE ELECTIVE COURSE

## 22. Masterpieces of Roman Literature.

(PETERSSON)

Lectures and private reading. No knowledge of any foreign language is required.

2 hrs., second half-year. M W, 8. Prerequisite: the junior certificate.



# UPPER DIVISION MAJOR COURSES

Courses A, B, L, 1 to 5, author courses; 1B, 5B, sight reading; CA-CB, 3A-3B, composition courses; all of which are described above with the prerequisites necessary, may be taken as free electives by students in the upper division.

The specific prerequisite for all of the major courses is course 5. Course 107, 108, 110 or 111 must precede all others, and but one of them may be taken.

104. Latin Composition, II. [See above.]

107. Tacitus, *Germania* and *Agricola*. Mackail's *Roman Literature*.  
(RICHARDSON)

3 hrs., first half-year. Tu Th, 9, M, 4. Prerequisite: course 5. Not open to students who have credit for course 108 or 110.

110. Horace, *Satires* and *Epistles*. (PRICE)

3 hrs., second half-year. M W F, 10. Prerequisite: course 5. Not open to students who have credit for course 107 or 108.

111. Cicero, *Brutus*. Tacitus, *Dialogus*. (PETERSSON)

3 hrs., second half-year. M W F, 9. Prerequisite: course 5. Not open to students who have credit for course 107, 108 or 110.

112A-112B. Latin Composition, III. [See above.]

113A-113B. Latin Composition, IV. [See above.]

115. Roman Elegiac Poetry. (DEUTSCH)

Selections from Tibullus, Propertius, and Ovid.  
3 hrs., second half-year. M W F, 10.

116. Ovid; Propertius. (RICHARDSON)

Ovid, *Fasti*; Propertius, Book IV. Roman religion and folk-lore, with modern parallels.  
3 hrs., first half-year. Tu Th, 10; W, 4.

118A. Tacitus, *Histories*. (NUTTING)

Selections from the *Histories* of Tacitus.  
3 hrs., second half-year. M W F, 3.

118B. Suetonius. (NUTTING)

Selections from the *Lives* of the Caesars.  
2 hrs., first half-year. Tu Th, 9.

120. Martial and Juvenal. (MERRILL)  
Society under the Caesars. Two satires of Juvenal will be read privately in addition to those discussed publicly.  
2 hrs., first half-year. M W, 11.
121. Elementary Roman Law. (MERRILL)  
The Institutes of Justinian.  
2 hrs., first half-year. Tu Th, 11. This course is listed in the department of jurisprudence. It is open also to students who have credit for course L, and to others by permission of the instructor.
122. Roman Literature. (PETERSSON)  
Lectures, and reading in Latin and English.  
3 hrs., second half-year. M W F, 8.
125. Lucretius: De Rerum Natura. (PETERSSON)  
Critical interpretation of the poem; outline of the Epicurean system.  
3 hrs., first half-year. M W F, 9.
135. Teachers' Training Course. (RICHARDSON)  
Problems in teaching Latin; estimates of text-books; examination of questions in pronunciation and syntax; exercises in teaching preparatory authors.  
3 hrs., second half-year. M W F, 2. Additional prerequisite: senior or graduate standing.
139. Roman Comedy. (PETERSSON)  
Selected plays of Plautus and Terence. Study of the language and versification, and of the poet's relations to the sources and to earlier comedy, with some consideration of the customs of the Roman stage.  
3 hrs., second half-year. Tu Th, 8, and a third hour.
- 140B. Latin Grammar: Syntax of the Verb. (NUTTING)  
A survey of some of the important problems of Latin syntax.  
2 hrs., second half-year. Tu Th, 10.
153. Roman Private Life. (WASHBURN)  
Lectures illustrated from the antiquities of Pompeii and Rome. Colateral reading with reports.  
2 hrs., first half-year. Tu Th, 11.
170. Descriptive Poetry of the Silver Age. (MERRILL)  
Selections from Manilius, Lucan, Valerius Flaccus, Statius, Silius Italicus and Claudian.  
2 hrs., second half-year. M W, 11.

173. The Aeneid of Virgil. (DEUTSCH)  
 Reading of Aeneid VII–XII: study of the poem as a literary type, its sources, composition, and literary technique; and its influence on subsequent literature.  
 3 hrs., first half-year. M W F, 10.
181. Select Titles from the Digest. (MERRILL)  
 Books 18, 19, 20, 21, and 13.7 being part of the law of Contracts.  
 2 hrs., second half-year. Tu Th, 11. The consent of the instructor must be obtained before enrollment.
188. Caesar and Nepos. (NUTTING)  
 A study of these authors from the point of view of their adaptability for use in the high school. Extensive reading in the Latin texts.  
 2 hrs., second half-year. M W, 1.
191. Cicero. (PETERSSON)  
 A study of Cicero's character and his political and literary attitude as influenced by events in his life.  
 3 hrs., first half-year. M W F, 8.
193. Virgil from the Monuments. (WASHBURN)  
 The mythology, geography and archaeology of the Aeneid.  
 2 hrs., second half-year. Tu Th, 11.

# GRADUATE COURSES

- 230A–230B. Latin Verse Composition. (RICHARDSON)  
 Writing of Latin hexameters, elegiacs, sapphics, asclepiads and alcaics. Seniors may be admitted with the consent of the instructor.  
 1 hr., throughout the year. F, 3.
- 234A–234B. Latin Seminar. (MERRILL)  
 Criticism and interpretation of the *Silvae* of Statius. Training in philological method and in textual criticism. Lectures, exercises, and original papers.  
 3 hrs., throughout the year; 3 units each half-year. S, 10–12; Tu 4. Required normally of all candidates for higher degrees who make Latin their major subject.
- 259A–259B. Seminar in Latin Syntax. (NUTTING)  
 The work of the first half-year will be mainly the collection of material; the second half-year will be devoted to seminar exercises. A reading knowledge of German is essential.  
 2 hrs., throughout the year, to be arranged.

## 260. Roman Epigraphy.

(PRICE)

Lectures on epigraphy and exercises in the interpretation of published inscriptions, squeezes, and facsimiles. Open to qualified seniors.

3 hrs., second half-year. M W F, 3.

## 266. Catiline's Conspiracy.

(NUTTING)

A study, from the sources, of the causes and events of Catiline's Conspiracy. The data will be selected in part through private reading.

3 hrs., first half-year. M W F, 3.

## 283A-283B. Seminar in Classical Archaeology.

(WASHBURN)

Roman coins of the imperial period, of which the University owns several hundred, will be the basis of work. Required of all candidates for higher degrees who make classical archaeology their major subject.

2 hrs., throughout the year. S, 10-12.

## 285. Advanced Latin Composition.

(NUTTING)

Presented from the point of view of teaching the subject. Practice in making English exercises for translation into Latin. Collection of material bearing on the style and idiom of Cicero.

1 hr., either half-year; first half-year, Tu, 10; second half-year, F, 1.

## SUSPENDED COURSES

The following courses will not be given in 1918-19: 108, Cicero's Letters; 117, Virgil's Georgics; 119, Patristic Latin; 123, Tacitus Annals; 124, Early Latin; 126, Quintilian; 133, Cicero, De Finibus; 137, Catullus; 140A, Latin Grammar, Forms; 141, Latin Palaeography; 143, Roman Religion; 149, Sight Translation, III; 151, Cicero, Tusculans; 154, Ancient Rome; 156, Roman Tragedy; 162, Plautus; 169, Statius and Ausonius; 171, Livy; 176, Roman Novel; 177, Life of Caesar; 192, Pompeii; 195, Prose Literature of the Empire.

**LIBRARY SCIENCE**

JOSEPH C. ROWELL, M.A., Librarian.

<sup>1</sup>HAROLD L. LEUPP, A.B., Associate Librarian.

SIDNEY B. MITCHELL, M.A., Acting Associate Librarian and Head of  
Accessions Department.

EDITH M. COULTER, A.B., B.L.S., Reference Librarian.

NELLA J. MARTIN, A.B., Senior Assistant in the Library.

The courses offered below are planned as a whole to give the essentials of library training. They will at present be open only to those who expect to take the complete work. Students are advised whenever possible to take 101 and 102 in the senior year and to include 103 and 104 in a fifth or graduate year. Juniors may, however, be permitted to elect the first two courses and to take the others when they become seniors.

As the classes will be limited in numbers, those interested should make application in person to the Acting Associate Librarian before instruction begins.

**UPPER DIVISION MAJOR COURSES**

**101A-101B. Bibliography.**

(COULTER, MITCHELL)

Dictionaries, encyclopaedias, indexes, handbooks, directories, and general works of reference, subject and trade bibliographies periodicals and society publications, atlases and maps, United States government publications, and California state documents. Practice in the preparation of reading lists and bibliographies. Lectures, reports, and problems.

3 hrs., throughout the year. M W F, 8. Prerequisite: junior standing.

**102A-102B. Cataloguing and Classification.**

(MARTIN)

The study of the card catalogue with consideration of the problems of author and title entries as illustrated by typical examples; the assignment of subject headings. Instruction given in class will be followed by actual cataloguing of books selected in illustration of different problems. The arrangement of books on the shelves, that is, their classification, will be studied with particular reference to the Dewey decimal system, but also with some attention to the Library of Congress scheme.

3 hrs., throughout the year. M W F, 4. Prerequisite: junior standing.

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<sup>1</sup> Absent on leave for the duration of the war.

**\*103A-103B. Library Administration and Extension.**

Brief outline of library history and of library development and legislation in the United States. Organization of different types of libraries. Library planning and furnishing. Library support and government; office management, care and filing of records and correspondence; library budgets and accounts; supplies; ordering of books and periodicals; accessioning. Catalogue routine. Loan department problems, charging systems, branches, stations, traveling libraries, inter-library loans. Work with children and schools. Extension and publicity.

3 hrs., throughout the year, to be arranged. Prerequisite: senior standing.

**\*104A-104B. The Study and Selection of Books.**

History of printing and of books. Present day book making and printing, style and arrangement of type, preparation of copy and correction of proof. Book paper, book illustration. Binding, materials and methods, editions, publishers. Selection of books for libraries of different types; study of guides, standard lists and of current book reviewing periodicals; evaluating books and making book notes; critical examination of a selected list of new publications.

3 hrs., throughout the year, to be arranged. Prerequisite: senior standing.

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**LINGUISTICS****\*101A. Phonetics.**

An introduction to the general principles of phonetics, with illustrations from English, French, and German. Recommended for advanced students who intend to take courses in philology, ancient or modern, or in linguistic theory.

2 hrs., first half-year. M W, 11.

**140A-140B. A General Introduction to the History of Speech. (CARNOY)**

For all students who specialize in languages.

2 hrs., throughout the year. M W, 11.

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\* Not to be given until 1919-20.

# MATHEMATICS

MELLEN W. HASKELL, Ph.D., Professor of Mathematics.

GEORGE C. EDWARDS, Ph.B., Professor of Mathematics, Emeritus.

DERRICK N. LEHMER, Ph.D., Professor of Mathematics.

FLORIAN CAJOBI, Ph.D., Sc.D., LL.D., Professor of the History of Mathematics.

CHARLES A. NOBLE, Ph.D., Associate Professor of Mathematics.

THOMAS M. PUTNAM, Ph.D., Associate Professor of Mathematics.

JOHN H. McDONALD, Ph.D., Assistant Professor of Mathematics.

BENJAMIN A. BERNSTEIN, Ph.D., Assistant Professor of Mathematics.

FRANK IRWIN, Ph.D., Assistant Professor of Mathematics.

\*THOMAS BUCK, Ph.D., Assistant Professor of Mathematics.

PAULINE SPERRY, Ph.D., Instructor in Mathematics.

FRANK R. MORRIS, Ph.D., Instructor in Mathematics.

CLYDE WOLFE, M.A., Teaching Fellow in Mathematics.

ERNEST W. PEHRSON, A.B., Teaching Fellow in Mathematics.

D. VICTOR STEED, A.B., Teaching Fellow in Mathematics.

*Honor-students in the Upper Division.*—Students who wish to become honor-students in mathematics must obtain permission from the department. They should elect courses 5, 6, 8, and 9 in the lower division. The specific courses in preparation for the final examination are 109A-109B, 111, 112, 114, and 119. But work in course 199, in which honor-students are expected to enroll throughout the upper division, may, with the approval of the department, be substituted for one or more of these courses.

All candidates for honors in mathematics will be expected to pass a general examination in that subject in lieu of the examinations of the special courses of their final half-year. The examination will be partly written and partly oral, and will include the following subjects:

1. Geometry of the plane and of space, both analytic and projective.
2. The differential and integral calculus, including the elements of differential equations.
3. Algebra: theory of algebraic equations.

## LOWER DIVISION COURSES

### A. Algebra.

3 hrs., either half-year. Tu Th S, 9, 10, 11. Course A is substantially equivalent to matriculation subjects 4a' and 4a".

### B. Solid and Spherical Geometry.

(McDONALD)

2 hrs., either half-year. Tu Th, 9. Course B is equivalent to matriculation subject 4b.

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\* Absent on leave for the duration of the war.

## C. Plane and Spherical Trigonometry.

3 hrs., either half-year. Tu Th S, 9, 10, 11. Course C includes matriculation subject 12a<sup>2</sup>. Prerequisite: course A or matriculation subject 4a<sup>1</sup>.

## E. Algebra and Plane Trigonometry.

(BERNSTEIN)

This course is planned for the needs of students in the College of Commerce.

4 hrs., first half-year. M Tu Th F, 10.

## 2. Mathematical Theory of Investment.

(BERNSTEIN, WOLFE)

4 hrs., either half-year. M Tu Th F, 10. Prerequisite: course E (or its equivalent). Prescribed in the College of Commerce.

## 3-4. Elements of Analysis, with Applications.

A practical two-year course in algebra, analytic geometry, the differential and integral calculus, adapted particularly to the needs of students in engineering, architecture, and chemistry.

## 3A-3B. Plane Analytic Geometry and Differential Calculus.

3 hrs., throughout the year, beginning either half-year. M W F, 8, 9, 10. 3B will be given first half-year, M W F, 9.

## 3AB. Plane Analytic Geometry and Differential Calculus.

6 hrs., second half-year. Daily at 10. For freshmen entering in January only.

## 4A-4B. Solid Analytic Geometry and Integral Calculus.

3 hrs., throughout the year, beginning either half-year. M W F, 8, 9, 10. 4B will be given first half-year, Tu Th S, 8.

## 5. Plane Analytic Geometry.

(HASKELL, IRWIN)

The straight line, the circle, and the conic sections, including a discussion of the general equation of the second degree.

3 hrs., either half-year. M W F, 2. Prerequisite: course C.

## 6. Introduction to Projective Geometry.

(LEHMER, SPERRY)

3 hrs., either half-year. First half-year, M W F, 10; second half-year, M W F, 3. Course 6 includes matriculation subject 12a<sup>1</sup>. Required of all candidates for the teacher's recommendation.

## 8. Advanced Algebra.

(IRWIN, SPERRY)

Permutations and combinations, probabilities, convergency of series, complex numbers.

3 hrs., either half-year. M W F, 3.



9. Introduction to Differential and Integral Calculus.

(McDONALD, BUCK)

3 hrs., either half-year. First half-year, M W F, 9; second half-year, M W F, 10. Prerequisite: course 5.

N11. Plane and Spherical Trigonometry, Logarithms, Principles of Map Construction.

(HASKELL, LEHMER)

For students preparing for Naval Service.

3 hrs., either half-year. M W F, 2.

N12. Introduction to Analytic Geometry.

(HASKELL, LEHMER)

For students preparing for Naval Service.

3 hrs., either half-year. M W F, 2.

FREE ELECTIVE COURSE

21A-21B. The History of Mathematics and Physics.

(CAJORI)

A non-technical course, open to all students.

2 hrs., throughout the year. Tu Th, 11.

UPPER DIVISION MAJOR COURSES

These courses are open to students in the lower division who have the necessary prerequisites.

101. Elementary Geometry for Advanced Students.

(HASKELL)

Selected topics in elementary geometry, with particular emphasis on recent developments.

3 hrs., second half-year. M W F, 9. Prerequisite: courses 5 and 6.

102. Elementary Algebra for Advanced Students.

(NOBLE)

Selected topics in elementary algebra, with particular reference to modern points of view.

3 hrs., first half-year. M W F, 3. Prerequisite: courses 8 and 9.

103A-103B. The Teaching of Mathematics in Secondary Schools. (CAJORI)

History of methods of teaching mathematics and a critical inquiry into present-day tendencies. For seniors and graduate students. This course will be accepted in partial satisfaction of the requirement in education for the teacher's recommendation.

2 hrs., throughout the year. Tu Th, 4.

109A-109B. Differential and Integral Calculus. Advanced Course.

(SPERRY)

3 hrs., throughout the year. M W F, 10. 109B will also be given by Mr. Irwin first half-year, M W F, 9. Prerequisite: course 9.

- 110A. Advanced Calculus. (HASKELL)  
The differential equations, both ordinary and partial, which occur most frequently in the applications, with special stress on approximate numerical solutions. Primarily for students of engineering.  
2 hrs., first half-year. Tu Th, 9.
- 110B. Advanced Calculus. (HASKELL)  
Definite integrals, multiple integrals, theory and use of infinite series, applications to practical problems. Primarily for students of engineering.  
2 hrs., second half-year. Tu Th, 9.
111. Determinants and Theory of Numerical Equations. (LEHMER)  
3 hrs., first half-year. M W F, 3.
112. Analytic Geometry of Three Dimensions. (PUTNAM)  
3 hrs., first half-year. M W F, 2.
113. Synthetic Projective Geometry. (LEHMER)  
3 hrs., first half-year. M W F, 9. Prerequisite: course 6.
114. Analytic Geometry. (Advanced Course.) (PUTNAM)  
Introduction to modern methods in analytic geometry.  
3 hrs., second half-year. M W F, 2. Prerequisite: course 5.
- \*115. Theory of Numbers. (LEHMER)  
Elementary properties of numbers, theory of congruences, residues of powers, primitive roots, quadratic forms.  
3 hrs., second half-year.
- \*116. Mathematical Theory of Investment.  
Intended primarily for juniors and seniors in the engineering colleges.  
2 hrs., second half-year. M W, 11. Prerequisite: course 4A-4B or its equivalent.
- \*117. Calculus of Finite Differences. (BERNSTEIN)  
2 hrs., second half-year. Prerequisite: course 9.
- 118A-118B. Algebra of Logic. (BERNSTEIN)  
3 hrs., throughout the year. M W F, 9.
119. Introduction to Differential Equations. (IRWIN)  
3 hrs., second half-year. M W F, 3.
- \*120. Theory of Probabilities. (BERNSTEIN)  
3 hrs., first half-year. Prerequisite: course 9.
- 125A-125B. Analytic Mechanics. (MCDONALD)  
3 hrs., throughout the year. M W F, 10. Prerequisite: course 109A.

\*Not to be given, 1918-19.

199A-199B. Honor-conference.

Individual weekly conferences with honor-students for their guidance in reading and research.

Throughout the year. Hours and credit to be arranged.

GRADUATE COURSES

- 201-202. Mathematical Seminar. (McDONALD)  
Advanced students will be guided in reading and research; frequent reports will be required. The particular aim of the seminar will be the training of students in independent investigation.  
Tu Th, 10, and special appointments. Credit value, 3 to 5 units each half-year, dependent on amount and quality of work done.
203. History of Fundamental Concepts of the Calculus and Fluxions. (CAJORI)  
Lectures and seminar.  
2 hrs., first half-year. M W, 4.
204. History of Infinite Series. (CAJORI)  
Lectures and seminar.  
2 hrs., second half-year. M W, 4.
211. Higher Plane Curves. (HASKELL)  
3 hrs., first half-year. M W F, 9.
212. Theory of Algebraic Surfaces. (LEHMER)  
3 hrs., second half-year. M W F, 9.
- 218A-218B. Logic of Mathematics. (BERNSTEIN)  
Analysis of the foundation principles of geometry and algebra.  
2 hrs., throughout the year. Tu Th, 9. Designed especially for teachers and prospective teachers of mathematics.
- \*221A-221B. Introduction to Modern Higher Algebra. (IRWIN)  
3 hrs., throughout the year.
222. Theory of Functions of a Real Variable. (IRWIN)  
3 hrs., first half-year. M W F, 3.
223. Partial Differential Equations. (McDONALD)  
The important partial differential equations of applied mathematics.  
3 hrs., second half-year. M W F, 3.
- 224A-224B. Theory of Functions of a Complex Variable. (NOBLE)  
3 hrs., throughout the year. M W F, 2.
- \*225. Elliptic Functions. (NOBLE)  
3 hrs., first half-year.

\*Not to be given, 1918-19.

- \*226. Elliptic Modular Functions. (HASKELL)  
3 hrs., second half-year.
227. Differential Geometry. (SPERRY)  
Application of differential and integral calculus to curves and surfaces.  
3 hrs., first half-year. M W F, 2.
228. Projective Differential Geometry. (SPERRY)  
3 hrs., second half-year. M W F, 2.
- \*231. Theory of Numbers. (LEHMER)  
3 hrs., second half-year.
233. Theory of Groups. Part I. (HASKELL)  
Theory of groups of substitutions, with application to the theory of algebraic equations.  
3 hrs., first half-year. M W F, 10.
234. Theory of Groups. Part II. (HASKELL)  
Elements of continuous groups, with application to the theory of differential equations.  
3 hrs., second half-year. M W F, 10.
- \*235. Seminar in Group-theory. (HASKELL)  
Klein's Lectures on the Icosahedron and the equation of the fifth degree.  
Hours and credit to be arranged.
237. Calculus of Variations. (NOBLE)  
3 hrs., second half-year.
250. Mathematical Colloquium.  
Meetings for the presentation of original work by members of the staff and graduate students. Open to graduate students. No credit.  
Alternate Tuesdays at 2.
251. Special Advanced Study and Research. (The STAFF)  
Hours and credit to be arranged.

## COURSES IN OTHER DEPARTMENTS

- Method of Least Squares. [See Astronomy 107.] (EINARSSON)
- Interpolation, Use of Tables and Mechanical Quadratures. [See Astronomy 108.] (EINARSSON)
- Theoretical Astronomy. [See Astronomy 206.] (LEUSCHNER)
- Descriptive Geometry. [See Drawing 3.] (KOWER, WYTHE and BROWER)

\*Not to be given, 1918-19.

# MECHANICAL AND ELECTRICAL ENGINEERING

CLARENCE L. CORY, M.M.E., D.Eng., John W. Mackay, Jr. Professor of Electrical Engineering, Consulting Electric Light and Heating Engineer, and Dean of the College of Mechanics.

JOSEPH N. LeCONTE, M.M.E., Professor of Engineering Mechanics.

BENEDICT F. RABER, B.S., Associate Professor of Mechanical Engineering.

WILLIAM F. MARTIN, M.C.E., Assistant Professor of Engineering Mechanics.

\*REUBEN S. TOUR, M.S., Assistant Professor of Gas Engineering.

\*HERBERT B. LANGILLE, A.B., Assistant Professor of Machine Design and and Mechanical Drawing.

\*FRED E. PERNOT, Ph.D., Assistant Professor of Electrical Engineering.

BALDWIN M. WOODS, Ph.D., Assistant Professor of Theoretical Mechanics.

DAVID W. DICKIE, Lecturer on Marine Engineering and Naval Architecture.

LLOYD N. ROBINSON, B.E., Instructor in Electrical Engineering.

\*BLAKE R. VANLEER, B.S., Instructor in Mechanical Engineering.

GEORGE L. GREVES, M.S., Instructor in Electrical Engineering.

ARTHUR B. DOMONOSKE, B.S., Instructor in Mechanical Engineering.

GEORGE E. COX, Assistant in Mechanics and Foreman of Woodwork.

JAMES GEORGE, Assistant in Mechanics and Foreman of Ironwork.

*Fees.*—Laboratory deposits in this department are at the rate of \$5 a half-year for each laboratory or mechanical practice exercise a week, except that graduate students will be exempt from fees in graduate laboratory courses designed as research courses. The average amount returned to the student at the end of the half-year is about two-fifths of the deposit.

*Honors.*—Students will be recommended for honors on the basis of the work done in the regular curriculum of the senior year. Particular emphasis will be placed upon the thesis.

## MECHANICAL ENGINEERING

### LOWER DIVISION COURSES

#### 1A. Elements of Steam Engineering. (———)

Fundamental consideration of fuels, combustion, steam; boilers, furnaces, chimneys, etc.; steam engines, condensers, etc.

3 hrs., first half-year. Two sections: I, M W F, 8; II, M W F, 9.

Prerequisite: Physics 1A-1B. Chemistry 1A-1B, Mathematics 3A-3B.

\* Absent on leave for the duration of the war.

**6A. Machine Design.**

(—)

Elementary machine design. Work at the drawing board, supplemented by lectures upon the principles underlying machine design.

6 hrs., second half-year; 3 units. Two drafting sections: I, M F, 1-4; II, Tu Th, 1-4; lecture hour to be arranged. Prerequisite: Drawing 3D.

**7. Automobile and Truck Construction.**

(RABER)

Illustrated lectures on typical details of automobile construction, such as motors, valves and valve timing; oiling, cooling and ignition systems; clutches, transmissions and rear axle systems. Designed to meet the demand for such knowledge as will facilitate intelligent driving and regular maintenance of automobiles and automotive trucks. Open to students with sophomore standing.

3 hrs., first half-year. Sec. I, M W F, 9; Sec. II, M W F, 1.

**7A. Mechanical Practice.**

(RABER)

Elementary work in the automotive laboratory.

6 hrs., either half-year; 2 units. Hours to be arranged. Prerequisite: course 7 or its equivalent.

**8A. Mechanical Practice.**

(COX)

Shop work in wood, including pattern making.

6 hrs., first half-year; 2 units. Four section: I, M F, 1-4; II, Tu Th, 9-12; III, Tu Th, 1-4; IV, W, 1-4, and S, 8-11.

**8B. Mechanical Practice.**

(COX)

Continuation of course 8A.

6 hrs., second half-year; 2 units. Four sections: I, M F, 1-4; II, Tu Th, 9-12; III, Tu Th, 1-4; IV, W, 1-4, and S, 8-11.

**9A. Mechanical Practice.**

(GEORGE)

Shop work in iron, including machine work.

6 hrs., first half-year; 2 units. Four sections: I, M F, 1-4; II, Tu Th, 9-12; III, Tu Th, 1-4; IV, W, 1-4, and S, 8-11. Prerequisite: course 8A or 8B.

**9B. Mechanical Practice.**

(GEORGE)

Continuation of course 9A.

6 hrs., second half-year; 2 units. Four sections: I, Tu Th, 9-12; II, Tu Th, 1-4; III, M F, 1-4; IV, W, 1-4; S, 8-11.

NOTE.—Properly qualified students in any college of the University may elect a total of one year of shop work such as course 8A, first half-year, followed by course 9A, second half-year.

UPPER DIVISION MAJOR COURSES

101A-101B. Engineering Mechanics.

(MARTIN)

Problems in theoretical and applied mechanics, selected to strengthen the student's practical mathematical working power; review of fundamental mathematical theorems and formulas. Open to all students who have some working power in differential and integral calculus.

2 hrs., throughout the year. Hours to be arranged.

102A-102B. Engineering Mechanics.

(LECONTE, MARTIN)

Theoretical mechanics of engineering.

3 hrs., throughout the year. Three sections: I, M W F, 8 (mining students); II, M W F, 9 (mechanics students); III, M W F, 10 (C. E. students). Prerequisite: Mathematics 3A-3B, 4A-4B, or 9 and 109.

103A. Hydraulics.

(LECONTE)

The principles of hydraulics with special reference to their application in the development of power.

3 hrs., first half-year. M W F, 8. Prerequisite: course 102A-102B, or Physics 105A-105B.

103B. Hydraulic Machinery.

(LECONTE)

Discussion of the theory underlying the design of hydraulic motors, pumps, and other apparatus operated through the agency of water.

3 hrs., second half-year. M W F, 8. Prerequisite: course 103A or Civil Engineering 110.

103C-103D. Elementary and Practical Course in Hydraulics.

Practical problems upon cost of piping, well digging, selection of pumping machinery and central station pumping plants, wind-mills, etc. Reports upon visits to hydraulic installations; oral and written abstracts of engineering papers. Recitations.

2 hrs., throughout the year. Tu Th, 11. The class will be limited to 15. Course 102A-102B must precede or accompany this course.

104A-104B. Kinematics.

(LECONTE)

*Theoretical:* Motion without reference to the cause which produces it; pure mechanism or the mutual dependence of the movements in the parts of a machine. *Applied:* Application of the preceding to the various kinematic problems connected with machine design and construction, such as link-motion, transmission by rolling and sliding contact, teeth of wheels, cams, form and proportions of the steam-engine and other motors.

2 hrs., throughout the year. Tu Th, 8. Prerequisite: course 102A-102B or Physics 105A-105B.

## 104c-104d. Kinematics.

(MARTIN)

Drafting and designing; to be taken only in conjunction with course 104A-104B.

3 hrs., throughout the year; 1 unit each half-year. W, 1-4.

## 105A. Thermodynamics.

(RABER)

Relations between heat and mechanical energy. Thermal properties of perfect gases. Consideration of heat power engines using perfect gases, including the analyses of cycles, the thermodynamic calculations for designs, and the practical operating features of air compressors and air engines, gas, oil, and Diesel engines.

3 hrs., first half-year. M W F, 10. Prerequisite: course 102A-102B or Physics 105A-105B.

## 105B. Thermodynamics.

(RABER)

Thermal properties of vapors. Consideration of heat power engines using vapors, including the analyses of cycles, the thermodynamic calculations for designs, and the practical operating features of reciprocating vapor engines, turbines, refrigerating systems and power plant auxiliaries.

3 hrs., second half-year. M W F, 10. Prerequisite: course 105A.

## 106B. Machine Design.

Continuation of course 6A. Design of machine parts and finally of a typical machine suitable for illustrating the general principles of engineering design.

6 hrs., first half-year; 2 units. Two sections: I, M F, 1-4; II, Tu Th, 1-4. Prerequisite: course 6A.

## 106C. Advanced Machine Design.

A continuation of course 106B, involving the complete design of a steam engine, air compressor or similar mechanism. Open as an elective course to students who have completed courses 6A and 106B.

6 hrs., second half-year; 2 units. M F, 1-4, or Tu Th, 1-4. Completion of courses 102A-102B, 104A-104B, 104c-104d is particularly desirable as a preparation for this course. Courses 104A and 104c may be taken concurrently.

## 107A-107B. Hydraulic Laboratory: Experimental Engineering. (LECONTE)

The general principles of hydraulics, including methods of measuring water, calibration of instruments, meters and weirs; tests of pumps, turbines and water wheels.

3 hrs., throughout the year; 1 unit each half-year. Two sections: I, Tu, 1-4; II, Th, 1-4. Prerequisite: courses 103A, 103B, or 103c-103d or Civil Engineering 110, or may be taken concurrently with one of these courses.



- 107C-107D. Mechanical Laboratory: Experimental Engineering. (RABER)  
 Calibration of instruments and auxiliary apparatus used in testing.  
 Tests of steam engine, steam pump, gas engine, air compressor, boiler, etc. Steam calorimetry. Fuel testing.  
 3 hrs., throughout the year; 1 unit each half-year. Two sections: I, Tu, 1-4; II, Th, 1-4. Prerequisite: course 1A; should be taken in conjunction with courses 105A, 105B.
- 108B. Internal Combustion Engines. (RABER)  
 Theoretical consideration of various cycles. Comparison and application of the Diesel and Otto cycle. Operation of internal combustion engines and their accessories.  
 2 hrs., second half-year. Tu Th, 9. Prerequisite: courses 1A and 105A.
- 109B. Steam Power Plant Design. (RABER)  
 The design of a complete steam power plant and the formulation of specifications therefor.  
 2 hrs., second half-year, to be arranged. Prerequisite: course 1A.
114. Thesis. (The STAFF)  
 For the regulations governing thesis work see the Circular of Information, Academic Departments. Candidates for B.S. who elect their thesis work in the department of mechanical and electrical engineering will register, during both half-years of the last or senior year, for course 114. Candidates who elect their thesis work in another department will register according to the announcement of that department.  
 2 units, either half-year.
- 125B. Fuel Testing.  
 Physical tests, analyses and calorimetry of gaseous, liquid and solid fuels. Combustion and deductions from fuel tests in conjunction with tests of the products of combustion. May be taken without 125D. Lectures.  
 1 hr., second half-year, to be arranged. Prerequisite: course 1A.
- 125D. Fuel Testing. Laboratory.  
 Course to accompany 125B, which latter must be taken in conjunction with this course.  
 3 hrs., second half-year; 1 unit. Prerequisite: course 1A.
- 126B. Steam Turbines. (RABER)  
 Rotative heat power engines, and their auxiliaries; design of steam nozzles, of blading, and of governor details. Turbine operation illustrated by inspection trips to typical plants. Open to seniors and graduate students.  
 2 hrs., second half-year, to be arranged. Prerequisite: course 1A; course 105B must be taken concurrently.

**GRADUATE COURSES**

215A-215B. Advanced Problems in Engineering Mechanics and Hydraulics. (LECONTE)

1 hr., throughout the year, to be arranged.

219. Mechanical Engineering: Research Laboratory. (RABER)

First half-year. Hours to be arranged. Prerequisite: courses 105A, 105B, and 107C-107D.

220. Gas Power Engineering. (RABER)

The theory and design of gas, gasoline and oil engines; gas producer practice; the combustion of gaseous fuels.

3 hrs., second half-year, to be arranged. Prerequisite: courses 1A, 105A, and 105B; or the latter may be taken concurrently.

221. Aerodynamics. (WOODS)

The principles of motion in a fluid as applied to the aeroplane, and to the design of its fundamental parts.

2 hrs., first half-year, to be arranged. Prerequisite: course 102, Mathematics 110.

**ELECTRICAL ENGINEERING****LOWER DIVISION COURSES**

1B. Elements of Electrical Engineering. (——)

Open to sophomores in the engineering colleges, especially those who have had Mathematics 3A-3B and Physics 2C.

3 hrs., second half-year. Two sections: I, M W F, 8; II, M W F, 9.

6A-6B. Wire and Radio Telegraphy. (GREVES and ——)

Lectures and recitations on the theories and practice involved in electrical means of communication. Laboratory practice in the uses and adjustment of apparatus and drill in the use of the code. Designed primarily for students preparing to become radio operators. Open to students with sophomore standing.

6 hrs., throughout the year; 4 units each half-year. Lectures, M W F, 8; laboratory hours to be arranged.

**UPPER DIVISION MAJOR COURSES**

100A. Direct Current Machinery. (GREVES)

Theory, operating characteristics and uses of direct current machinery and equipment. For engineering students not registered in the College of Mechanics.

2 hrs., first half-year. Tu Th, 9. Prerequisite: Mathematics 3A-3B, Physics 2C-2D.

- 100b. Alternating Current Machinery. (GREVES)  
A continuation of course 100A. Theory, operating characteristics and uses of alternating current machinery and equipment. For engineering students not registered in the College of Mechanics.  
2 hrs., second half-year. Tu Th, 9. Prerequisite: course 100A.
- 100c. Electrical Laboratory: Direct Current Machinery. (GREVES)  
3 hrs., first half-year; 1 unit. W, 2-5. Course 100A must be taken concurrently.
- 100d. Electrical Laboratory: Alternating Current Machinery. (GREVES)  
3 hrs., second half-year; 1 unit. Th, 1-4. Course 100b must be taken concurrently.
- 110A-110B. Electrical Machinery and Construction. (CORY)  
The construction and operation of electrical machinery, and its application to electric lighting and power distribution.  
2 hrs., throughout the year. Tu Th, 11. Prerequisite: course 1b, Mathematics 4A-4B and Physics 2C-2D.
- 110c. Electrical Machinery and Construction: Laboratory. (ROBINSON)  
3 hrs., second half-year; 1 unit. Course 110b must be taken concurrently. Two sections: I, Tu, 1-4; II, W, 1-4.
- 111A-111B. Alternating Currents and Alternating Current Machinery. (CORY)  
The theory of the generation of single-phase and poly-phase alternating currents, the use of the complex quantity, and the calculation of the regulation and behavior of alternating current apparatus and transmission lines. The theory of the single-phase and poly-phase induction motor, synchronous motor, and rotary converter, and their effects and operation in transmission systems.  
4 hrs., throughout the year. Tu Th, 9-11. Prerequisite: courses 110A-110B and 110c; Mechanics 102A-102B or Physics 105A-105B; Physics 107A-107B.
- 111c-111d. Alternating Currents and Alternating Current Machinery: Laboratory. (ROBINSON, GREVES)  
6 hrs., throughout the year; 3 units each half-year. Two sections: I, M, 1-7; II, Tu, 1-7. Prerequisite: courses 110A-110B, 110c, Mechanics 102A-102B or Physics 105A-105B, and Physics 107A-107B.
114. Thesis. (The STAFF)  
For the regulations governing thesis work see the Circular of Information, Academic Departments. Candidates for B.S. who elect their thesis work in the department of mechanical and electrical engineering will register, during both half-years of the last or senior year, for course 114. Candidates who elect their thesis work in another department will register according to the announcement of that department.  
2 units, either half-year.

**115A-115B. Signal Corps Course in Radio Communication. (GREVES)**

The theory of radio circuits, apparatus and auxiliary equipment and their applications to radio telegraphy and telephony. Circuits and types of apparatus used by the U. S. Army and Navy.

At the request of the Signal Corps, this course is offered during the period of the war to students in engineering, chemistry and physics who have completed the work of two years. Such students may be enlisted in the Signal Enlisted Reserve Corps, and be assigned to complete the four year course.

3 hrs., throughout the year, to be arranged. Prerequisites: Mathematics 4A-4B, Physics 2C-2D. Courses 100ABCD or 110ABC and course 115CD must be taken concurrently.

**115C-115D. Signal Corps Course in Radio Communication. Laboratory. (GREVES)**

4 hrs., throughout the year; 2 units each half-year. Course 115A-115B must be taken concurrently. Hours to be arranged.

**119A-119B. Elements of Electrical Design. (———)**

Theoretical principle underlying the construction and operation of electrical apparatus; application of principles to practical design and the general problems connected with direct current and alternating current machinery.

3 hrs., throughout the year; 2 units each half-year. F, 1-4. Prerequisite: courses 1B and 110A-110B.

**122A-122B. Special Problems in Electrical Engineering. (The STAFF)**

Throughout the year. Hours to be arranged.

**GRADUATE COURSES**

Graduate students who wish to engage in advanced work in hydraulics, thermodynamics, experimental engineering, electrical engineering, or related subjects will be admitted to any of the courses offered, on giving evidence that they possess the fundamental knowledge which will enable them to profit by the instruction. They will also be given all possible assistance outside the lecture room in pursuit of advanced study and original investigation. A well equipped building is devoted to the work of these branches of engineering.

**212A. Advanced Theoretical Electrical Engineering. (———)**

Lectures on selected subjects of an advanced technical nature. Open to seniors and graduate students.

2 hrs., first half-year. M W, 11.

**212C. Electrical Engineering: Research Laboratory. (The STAFF)**

First half-year. Hours to be arranged.

214. Electrical Traction.

(ROBINSON)

The application of electric motive power to railways. Motor equipments, speed-time curves, and schedules; economics of location and equipment. Open to senior and graduate students in electrical engineering.

3 hrs., first half-year; 3 units. Hours to be arranged.

216. Power Plant Engineering.

(ROBINSON)

Investigation of electric generating and sub-stations, high tension transmission and low tension distribution, preliminary engineering, economic location, and operation, including load curves and other controlling considerations.

2 hrs., second half-year; 2 units. Open to seniors and graduates who are taking or have taken the equivalent of Mechanics 103A, 103B, 105A, 105B, 110A–110B.

217. Electrical Oscillations, Line Surges, and Transmission Line Phenomena. Radio-Telegraphy.

Open to seniors and graduates students. Lectures.

2 hrs., second half-year. M W, 11.

## GAS ENGINEERING

### UPPER DIVISION MAJOR COURSES

117B. Gas Engineering.

(———)

Methods and processes used in the manufacture of illuminating gas, including coal gas, carburetted water gas, and oil gas; construction and operation of gas manufacturing plants. Supplementary lectures on alternate Fridays by gas engineers of the Pacific Coast.

3 hrs., second half-year; 2 units. M W, alt. F, 11. Prerequisite: Mechanics 1A, course 118A–118B, or Chemistry 126, 111.

118A–118B. Gas Engineering Laboratory.

(———)

Analysis of illuminating gas. The calorific value of solid, liquid, and gaseous fuels. The determination of specific gravity. Photometry of gas illumination.

3 hrs., throughout the year; 1 unit each half-year. Hours to be arranged. Prerequisite: Chemistry 5 or equivalent.

120. Gas Engineering Laboratory.

(———)

Incidental tests such as for naphthalene, free carbon in tars, sulphur in purifying material, distillation of oil, etc.

3 hrs., first half-year; 1 unit. Hours to be arranged. Prerequisite: courses 117 and 118.

### GRADUATE COURSE

218. Gas Engineering: Research Laboratory.

(RABER and ——)

First half-year. Hours to be arranged. Prerequisite: courses 117, 118.

**MARINE ENGINEERING AND NAVAL ARCHITECTURE**

NOTE.—Lectures will be supplemented by visits to plants in actual operation.

**101A-101B. Naval Architecture.****(DICKIE)**

Areas, volumes, and centers of gravity of solids; displacement, center of buoyancy, metacenter, trim; coefficients (block, prism, mid-area); sectional area curves, displacement tables, cargo capacities, flooding, tonnage, free board, launching, strains and stresses; equivalent girder, resistance to stress, stability.

6 hrs., throughout the year; 4 units each half-year. Lectures, M W, 8; drafting, M W, 9-11. Prerequisite: junior standing in an engineering college or in architecture.

**102A-102B. Marine Engineering.****(DICKIE)**

Horsepower, resistance and propulsion of ships; fire-tube and water-tube boilers; oil and coal firing. Reciprocating and turbine engines; Diesel, semi-Diesel, and ordinary gas engines; shafting, propellers, and valve diagrams.

6 hrs., throughout the year; 4 units each half-year. Lectures, Tu Th, 8; laboratory, Tu Th, 9-11. Prerequisite: junior standing in an engineering college or in architecture.

**103A-103B. Nomenclature in Shipbuilding.****(DICKIE)**

Specifications, calculations of rudders and davits; Classification Society's rules; civil service and other United States requirements.

3 hrs., throughout the year; 2 units each half-year. Lecture, F, 8; laboratory, F, 9-11. Prerequisite: junior standing in an engineering college or in architecture.

**MEDICAL SCHOOL**

At present the instruction of the first one and one-half years of the medical course is given in Berkeley. The first year of this work may also be counted towards the bachelor's degree in the College of Letters and Science for those who have attained senior standing. See departments of anatomy, biochemistry and pharmacology, physiology, and pathology and bacteriology. For further information reference should be made to the special announcement of the Medical School.

**MILITARY SCIENCE AND TACTICS**

A unit of the Students' Army Training Corps will be organized at this University. This corps is a branch of the National Army. Enlisted students are therefore in the military service of the United States. The purpose of the organization is to provide a larger number of educated and trained men for the needs of the army, to be a source of supply for officers, and to meet the special and technical requirements of the service.

All male students over 18 years of age, regularly matriculated in the University, and physically qualified, may enlist in the Students' Army Training Corps. It is expected that provision for the equipment and maintenance of enlisted members will be made by the War Department. Matriculants under 19 years of age will be permitted to enroll and participate in the work of the unit but will not be enlisted members of the corps.

The details of the work in military science will be announced at the beginning of the fall session in September.



**MINING AND METALLURGY**

FRANK H. PROBERT, A.R.S.M., Professor of Mining; Dean of the College of Mining.

ERNEST A. HERSAM, B.S., Associate Professor of Metallurgy.

WALTER S. WEEKS, M.E., Associate Professor of Mining.

WALTER S. MORLEY, B.S., Assistant Professor of Metallurgy.

\*LESTER C. UREN, B.S., Assistant Professor of Mining.

*Honors.*—Students will be recommended for honors at graduation on the basis of the quality of work done in the regular curriculum of the senior year. Particular emphasis will be placed upon the student's capacity for original work.

*Vacation Work.*—All students are required to work eight weeks, prior to senior standing, in a mine, mill, smelter, or oil field, of which two weeks shall be spent in collecting data for a report to be submitted to the Mining Department. Two units of credit will be given for this report.

For the regulations governing thesis work, see Circular of Information, Academic Departments. Candidates for B.S. in mining, metallurgical or petroleum engineering may, with the approval of the study-lists committee, submit a thesis based on field studies.

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**MINING**

There are no laboratory fees in this department.

**LOWER DIVISION COURSES**

- 1A. Mine Surveying and Mapping. (WEEKS)  
Surface and underground mine surveys; methods of traversing and collecting details. Preparation of mine maps from survey data, and methods of representing geological and other features on mine maps. Lectures, field and drafting-room practice.  
9 hrs., first half-year; 3 units. Tu Th, 9-12; W, 1-4. Prerequisite: Civil Engineering 1A-1B, 3.
- 1B. Mine Mapping. (———)  
Continuation of course 1. Graphic records of engineering data; stopping charts, sampling diagrams, and bore-hole logs. Use of special instruments. An intimate study of the several types of mine models.  
3 hrs., second half-year; 1 unit. W, 1-4. Prerequisite: course 1.

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\* Absent on leave for the duration of the war.

**5. Engineering Drawing.**

(—)

Drafting-room practice, supplemented by occasional lectures, designed to meet the needs of mining students. Lettering; orthographic projection; preparation of working drawings; metallurgical flow sheets and geological sections; graphical methods of representing engineering data; copying processes.

6 hrs., second half-year; 2 units. M F, 1-4.

**UPPER DIVISION MAJOR COURSES****101A. Mine Development.**

(PROBERT)

Preliminary development, prospect and assessment work; choice of permanent entry; shaft sinking, tunneling, underground exploration. Elements of supports for mine excavations.

3 hrs., first half-year. M W F, 9. Prerequisite: course 103; Mechanics 102A-102B or Physics 105A-105B.

**101B. Mining Methods.**

(PROBERT)

Discussion of factors influencing choice of method. Modern practice in exploitation of veins and massive deposits.

2 hrs., second half-year. Tu Th, 11. Prerequisite: course 101A.

**103. Exploration and Surface Mining.**

(WEEKS)

Lectures on open-pit and placer mining, churn and diamond drilling, use of explosives and breaking of ground. Laboratory instruction in types of rock drills, sharpening steel, panning, and magnetic surveying.

5 hrs., second half-year; 3 units. Laboratory, Tu, 1-4; lectures, M W, 10. Prerequisite: Geology 1A, Mineralogy 1A, 1B.

**105. Mine Equipment.**

(WEEKS)

General discussion of power and mine equipment; transportation; hoisting, pumping, ventilating, and lighting.

3 hrs., second half-year. Tu Th F, 9. Prerequisite: course 101A, Mechanics 1A, 102A-102B, Electrical Engineering 100AB-100CD, Civil Engineering 108A. Course 111B to be taken concurrently.

**107. Economics of Mining.**

(PROBERT)

The economic operation of a mine; mining company incorporation and organization; mining investments; capital in mining; labor in mining; mine taxation; conservation of mineral resources; marketing ores and metals; production and consumption of metals; relation of the mining industry to other industries.

2 hrs., first half-year. Tu Th, 10. Course 101A to be taken concurrently.

109. Mine Cost-Accounting.

(—)

Lectures on mine accounting and cost-keeping from an engineering standpoint. Payment of workmen; purchase and distribution of mine supplies; production records; administrative reports; methods of filing and preparing engineering and statistical data.

2 hrs., second half-year. Tu Th, 8. To be taken concurrently with course 101B.

111A. Mining Machinery: Compressed Air.

(WEEKS)

Lectures, computations and laboratory. The compression of air and use of compressed air for mining purposes.

6 hrs., first half-year; 3 units. M Tu, 1-4. Prerequisite: Mechanics 1A, Electrical Engineering 100AB-100CD.

111B. Mining Machinery and Supplies.

(WEEKS)

Lectures, computations and laboratory. Power, mine ventilation, pumping, lighting, signalling, explosives, etc.

6 hrs., second half-year; 3 units. M W, 1-4. Prerequisite: course 111A; course 105 to be taken concurrently.

117. Thesis. (See general statement concerning required vacation work, above.)

In special cases a student may, with the approval of the study-lists committee, submit as a thesis a piece of work in any department in which he is qualified to pursue advanced studies.

2 units, either half-year.

Mining law is given in the Department of Jurisprudence (see Jurisprudence 216).

A course in mining hygiene (Hygiene 8), including first aid, mine sanitation, and rescue work is given by the Department of Hygiene, and is required of mining students.

GRADUATE COURSES

201. Research in Mining Practice.

(WEEKS)

First half-year; hours and credit to be arranged. Prerequisite: courses 101A, 101B, 105, and 111A, 111B.

203A-203B. Seminar in Mining.

(PROBERT)

Discussion of current mining literature and problems.

1 hr., throughout the year. M, 4. Prerequisite: senior standing in the College of Mining.

205. Mine Valuation.

(PROBERT)

Lectures on the examination, sampling and valuation of mines.

2 hrs., second half-year. M W, 11. Prerequisite: courses 101A, 101B, and 105. Open also to properly qualified seniors who are taking courses 101B and 105.

**PETROLEUM ENGINEERING****UPPER DIVISION MAJOR COURSES**

- \*115. Oil Field Development. (———)  
Prospecting for oil. Methods of drilling and controlling oil wells.  
2 hrs., first half-year. Tu Th, 11. Prerequisite: senior standing in any engineering college; open to seniors in Letters and Science whose major is geology.
- \*119. Petroleum Production Methods. (———)  
Methods of extracting oil from wells. Separation of water, sand and gas from oil. Transportation and storing petroleum. Economics of the oil industry. Valuation of oil lands.  
2 hrs., second half-year. Tu Th, 11. Prerequisite: senior standing in any engineering college; open also to seniors in Letters and Science whose major is geology.
- \*123. Petroleum Engineering Laboratory. (———)  
Investigation of special problems in the production, transportation and storage of petroleum. Practice in gauging and testing petroleum.  
6 hrs., first half-year; 2 units. Th F, 1-4. Prerequisite: Mechanics 1A, Electrical Engineering 100AB-100CB. Course 115 to be taken concurrently.
- \*125. Petroleum Cost-Accounting. (———)  
Oil field cost-keeping and accounting methods. Payment of workmen; purchase and distribution of supplies; production records and administrative reports.  
1 hr., first half-year. F, 10. To be taken only in conjunction with course 115.
- \*127. Utilization of Petroleum and its Products. (———)  
Use of petroleum and its derivatives as fuels; mineral oil lubricants, their characteristics and uses; refined distillates and their uses in furnishing light and heat; asphalt and its uses in paving and structural work; the mineral waxes and their uses. Lectures.  
1 hr., first half-year. M, 11. Prerequisite: junior standing in an engineering college; open also to seniors in Letters and Science whose major is geology.
- \*129. Production and Utilization of Natural Gas. (———)  
Control and management of gas wells; separation of gas from oil, transportation and storing natural gas; its utilization in developing light, heat, and power; separating gasoline from natural gas.  
1 hr., second half-year. F, 9. Prerequisite: course 115.
- \*131. Thesis or Summer Work. (See general statement concerning required vacation work, above).  
2 units, either half-year.

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\* Not to be given, 1918-19.

**METALLURGY**

*Laboratory Fees.*—Laboratory fees are \$15 per half-year in each of the laboratory courses 2, 104A, 104B, 110A, 110B, and 116. At the end of the half-year any unconsumed balance is returned to the student after deducting the cost of materials actually used and the breakage of apparatus.

**LOWER DIVISION COURSE**

2. Wet Assaying. (MORLEY)  
The principles and practice of wet assaying and volumetric analysis applied to the products of mine, mill, and smelter.  
7 hrs., second half-year; 3 units. M, 10; Tu Th, 1-4. Prerequisite: Chemistry 1A-1B.

**UPPER DIVISION MAJOR COURSES**

102. General Metallurgy. (HERSAM)  
The study of ores from a metallurgical standpoint. Sorting, concentrating, handling, sampling, and valuing ores and ore products; slags, fluxes and refractory materials. Metallurgical practices and the outline of standard process of treatment.  
2 hrs., first half-year. Tu Th, 8. Prerequisite: course 2, or Chemistry 5 or 6A, Physics 1AB, 2CD, Mineralogy 1A, 1B.
- 104A. Fire Assaying. (MORLEY)  
The proper use and care of the balance. Cupellation and parting of gold and silver. Preparation of ore samples. Scorification and crucible assays of gold and silver ores.  
7 hrs., first half-year; 3 units. Lectures, M, 11; laboratory, M Tu, 1-4. Prerequisite: course 2, and Mineralogy 1A, 1B.
- 104B. Advanced Assaying. (MORLEY)  
Lectures and laboratory practice in the assay of precious and base metal ores. Melting, refining and sampling of gold and silver bullion. The assay of alluvials for gold, silver, platinum and tin. Smelting practice and analysis of products.  
6 hrs., second half-year; 2 units. M F, 1-4. Prerequisite: course 104A.
106. Metallurgy of Iron and Steel. (HERSAM)  
The ores of iron and the methods of their reduction. The production of pig iron, wrought iron, and the various grades of steel. The physical properties of structural iron and steel as related to chemical composition and metallurgical treatment.  
2 hrs., second half-year. Tu Th, 10.

- 108A. Ore-Dressing. (HERSAM)  
The mechanical treatment of ores; the leading practices relating to crushing, sizing, classification, amalgamation, flotation and the various processes of concentration; theory of mechanical separation; principles underlying the possibilities of ore separation.  
2 hrs., first half-year. M W, 10. Prerequisite: courses 102 and 104A.
- 108B. The Metallurgy of Gold and Silver. (HERSAM)  
Lectures on the milling and amalgamation of gold and silver ores. The cyanide and other processes of extracting precious metals. Roasting and chlorination. A detailed study of existing plants.  
2 hrs., second half-year. M W, 9. Prerequisite: course 108A.
- 110A. Ore-Dressing Laboratory. (HERSAM)  
The operations of ore-dressing. Practice in crushing, sampling, and concentrating the ores of gold, silver, and the base metals. Experimentation on a working scale.  
6 hrs., first half-year; 2 units. Th F, 1-4. Prerequisite: course 102. Supplementary to course 108A.
- 110B. Metallurgical Laboratory. (HERSAM)  
Experiments in amalgamation, flotation and hydro-metallurgy of precious and base-metal ores.  
6 hrs., second half-year; 2 units. Th F, 1-4. Prerequisite: course 110A. Supplementary to course 108B.
112. Metallurgy of Lead and Copper. (MORLEY)  
Methods of smelting lead and copper ores with particular reference to the gold and silver content. A study of furnaces and the principles in their construction.  
2 hrs., first half-year. Tu Th, 11. Prerequisite: course 102.
116. Metallography. (MORLEY)  
The microscopic structure of metals and alloys as related to their physical and chemical properties, with special attention to iron and steel. Practice in the use of the microscope as applied to the examination of polished and etched metallic surfaces. Instruction in photo-micrography. Lectures and laboratory.  
4 hrs., either half-year; 2 units. W, 11 and 1-4. Prerequisite: course 106.
118. Thesis. (See general statement concerning required vacation work, above.)  
In special cases a student may, with the approval of the study-lists committee, submit as a thesis a piece of work in any department in which he is qualified to pursue advanced studies.  
2 units, either half-year.

**GRADUATE COURSES**

The foregoing undergraduate courses are open to graduate students whose previous preparation has fitted them to undertake the work.

**202. The Metallurgy of the Less Common Metals. (HERSAM)**

The metallurgical treatment of the ores of tin, zinc, antimony, arsenic, mercury, aluminum, and the platinum metals, including methods of reduction and refining these metals.

2 hrs., first half-year. M W, 11. Prerequisite: course 112.

**210A-210B. Special Investigation in the Treatment of Ores. (HERSAM)**

Programme of work to be arranged in each case.

Throughout the year. Prerequisite: course 110B.

**216. Metallography. (MORLEY)**

An extended study of the structure of iron and steel, including thermal analysis. The metallographic examination of the industrial alloys.

4 hrs., second half-year; 2 units. Th, 1-5. Prerequisite: course 116.

## MUSIC

\*CHARLES L. SEEGER, JR., A.B., Professor of Music.

EDWARD G. STRICKLEN, Instructor in Music.

PAUL STEINDORFF, Choragus.

Students who plan to specialize in music should confer with the head of the department at the beginning of the freshman year, in order to ensure the fulfillment of the departmental prerequisites in the lower division (courses 4A-4B and 5A-5B or their equivalent—knowledge of the theory and skill in the practice of elementary diatonic and chromatic harmony and strict counterpoint in five parts) and in order to lay, by studies in certain other departments, a foundation in the non-musical aspects of the courses in musicology. The major courses are: in composition, 104A-104B and 105A-105B; in performance, 109A-109B (in special cases, one-half of course 101 or 102 may be taken in place of course 109B); in musicology, 111A-111B and 112B-112B (these courses are given in alternate years).

*Honor-students in the Upper Division.*—Students in the honor-group who have completed the major in music with distinction may receive honors at graduation by showing ability to do original work either in composition or in a thesis upon a musicological subject. Honor-students will be allowed special privileges in the use of the library and the music building.

*Five-hour Courses.*—The schedule contemplates the combination of certain two and three-hour courses of complementary character in a five-hour series, with the following plans of enrollment: AB-3A, AB-1, 5A-6A, 101A-109A.

## Composition

*Notice to All Students.*—Ear-training, by practice in sight singing and in dictation, will be given as part of the regular work in courses AB, 4A, 4B. Students in all courses (course 3A alone excepted) may, without preliminary notice, be examined by the department in regard to their abilities in this respect and required to make good any deficiencies.

## LOWER DIVISION COURSES

AB. Symbols and Terminology of Musical Notation and Elementary Harmony and Counterpoint. (STRICKLEN)

Equivalent to matriculation subjects 21a and 21b.

3 hrs., either half-year; 3 units. First half-year, M W F, 1; second half-year, M W F, 2. Students whose work is of marked excellence may be admitted to course 4B in the following half-year.

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\*Absent on leave, 1918-19.



4A-4B. Diatonic Harmony and Two-part Strict Counterpoint. (First-year Course.) (STRICKLEN)

Treatment of the complete diatonic resources of the major and minor modes, including the simpler modulations. The contrapuntal studies are undertaken concurrently with the work in harmony.

3 hrs., throughout the year. M W F, 9. Prerequisite: familiarity with the symbols and terminology of musical notation together with a knowledge of intervals and simple metrical types (matriculation subject 21a). Students who desire to undertake regular work in harmony, but who find themselves unprepared in this respect, should enroll in course AB and arrange to take course 4B at the beginning of the following half-year.

4B will be given also during the first half-year (M W F, 10), leading to course 5A beginning February, 1919.

4A will be given also during the second half-year. M W F, 1.

5A-5B. Chromatic Harmony and Three-part and Four-part Strict Counterpoint. (Second-year Course.) (STRICKLEN)

3 hrs., throughout the year. Tu Th S, 9 (or other hour). Prerequisite: course 4A-4B.

5B will be given also during the first half-year. M W F, 2.

5A will be given also during the second half-year. M W F, 10.

UPPER DIVISION MAJOR COURSES

104A-104B. Contrapuntal Studies (Third-year course). (STRICKLEN)

Double and triple counterpoint; elementary canon and fugue.

3 hrs., throughout the year. M W F, 3. Prerequisite: course 5A-5B.

105A-105B. Composition. (Fourth-year course.) (STRICKLEN)

2 hrs., to be arranged; 2 units. Prerequisite: course 104A-104B.

*Performance*

NOTE.—Instruction in singing and in the technique of all instruments is offered in the Division of University Extension both in San Francisco and in Oakland. (See "Announcement of Courses in Music," Division of University Extension.)

LOWER DIVISION COURSES

1. Choral Practice. (STEINDORFF)

2 hrs., either half-year; 1 unit. Tu Th, 1. To receive credit, student must have passed or must be enrolled in some other course in the Department of Music. Any student in the University with a good singing voice may attend the meetings and take part in the final concert or operatic performance.

2. **Orchestral Practice.** (STEINDORFF)  
 2 hrs., either half-year; 1 unit. Sec. I (men), W, 7-9 p.m.; Sec. II (women), F, 1 and an hour to be arranged.
- 6A-6B. **Musicianship.** (STEINDORFF)  
 2 hrs., throughout the year. Tu Th, 2. Primarily for students who have studied or are studying the technique of an instrument or of the singing voice.

### UPPER DIVISION MAJOR COURSES

101. **Concert Repertoire.**  
 1-2 hrs., either half-year; 1 unit. Hours to be arranged. Prerequisite: course 11A-11B or exceptional vocal technique.
102. **Pianoforte Ensemble Practice.** (———)  
 Eight-hand symphonic arrangements. Open only to students who possess exceptional technique and who practice one hour or more every day.  
 2-3 hrs., either half-year; 2 units.
- 109A-109B. **Conducting and Instrumentation.** (STEINDORFF)  
 2 hrs., throughout the year; 2 units each half-year. Tu Th, 3, and preceptorial sections 2 hrs., each week to be arranged. Prerequisite: course 5A-5B. Course 6A may, unless previously taken, be required as supplementary study without credit in this course.

### *Musicology*

NOTE.—While not required, certain courses in anthropology, philosophy, historical and scientific methods, logic, psychology, social psychology, physics and literary criticism are practically essential to specialization in musicology.

### FREE ELECTIVE COURSE

- 3A-3B. **Introduction to the History of the Modern European Art of Music.** (———)  
 Lectures, reading and illustrative programmes of vocal, instrumental, and ensemble music.  
 3 hrs., throughout the year; 3 units each half-year. Tu Th, 1; W, 8-9 p.m.

# UPPER DIVISION MAJOR COURSES

111A-111B. History of the Modern European Art of Music.

Pro-seminar. Introduction to the Critique of Music.

3 hrs., throughout the year. Tu, 10-12; Th, 10. Prerequisite: course 5A-5B. Students must have completed course 104A-104B or else be taking it concurrently with this course.

112A-112B. Form.

Pro-seminar. Introduction to the science of music.

Throughout the year. Hrs. to be arranged.

110. The Teaching of Music.

(The STAFF)

3 or 4 hrs., second half-year; 3 units. Prerequisite: courses 104A-104B, 111A-111B; also course 109A-109B, which, however, may be taken concurrently with this course.

NOTE.—Technical skill as well as mature knowledge of the subject is required of the prospective teacher; the student will therefore be given separate final examinations inquiring into the systematization of musical knowledge and the ability to impart it under the exacting conditions of the modern school, as follows: (1) sight reading and dictation, (2) composition, (3) history of music, (4) pianoforte technique, (5) singing, (6) conducting.

## GRADUATE COURSE

\*200A-200B. Musicological Seminar.

(———)

Throughout the year. Hrs. to be arranged.

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\* Not to be given 1918-19.

**NAVAL PREPARATORY COURSES**

The following courses afford an opportunity for men to prepare themselves for service in the Navy. The subject matter is designed to meet the requirements necessary for the commission of Ensign, both in the line and in engineering duty. The essential courses for the former are 105, 107, 108, and 109; for the latter, courses 109 and 101, 102, 103. Students satisfactorily completing either of the foregoing groups of courses will be given a certificate to that effect. Those who have not had the equivalent of Mathematics N12 or of History N107 are strongly advised to take these courses.

Applicants for admission to the courses should apply to the Recorder of the Faculties. For further information consult Special Announcement concerning Courses Preparatory for Naval Service.

Courses 107, 108, 109 will be given by commissioned officers from the United States Navy.

**Mathematics N11.** Plane and Spherical Trigonometry, Logarithms,  
Principles of Map Construction. (LEHMER)  
3 units each half-year. M W F, 2.

**Mathematics N12.** Introduction to Analytic Geometry. (HASKELL)  
3 units each half-year. M W F, 2.

**Astronomy N105.** Navigation and Nautical Astronomy. (EINARSSON)  
5 units each half-year. Lectures, Tu Th S, 10; two laboratory periods,  
2 hours each, to be arranged. Prerequisite: N11, or its equivalent.

**Naval Preparation 107.** Seamanship. (———)  
Rules of the road; ground tackle; boat drill; general drill (coaling  
ship, clear ship for action, fire and collision, fire and rescue, abandon  
ship); signals.  
3 units each half-year. M W F, 7 p.m.

**Naval Preparation 108.** Ordnance and Gunnery. (———)  
Study of various types of guns; range finders; use of tables; precau-  
tions in handling arms and ammunition; duties and station of gun  
crew; fire control; plotting; precautions; small arms.  
3 units each half-year. M W F, 8 p.m.

**Naval Preparation 109.** Naval Regulations. (———)  
Organization of naval forces; boards; honors; ceremonies; officer's  
duties; naval administration and discipline; general orders.

Naval Preparation 101, 102, 103. Marine Engineering and Naval Architecture. (DICKIE)

10 units. For description see Department of Mechanical Engineering.

Naval Preparation 111. Physical Education. (KLEEGER)

Special work adapted to men preparing for the Navy, including Swedish exercises and naval drills.

3 hrs., each half-year;  $\frac{1}{2}$  unit. Hours to be arranged.

History 107. Naval History.

(STEPHENS)

3 units each half-year. M W F, 2.

Geography N150. Oceanography and Marine Meteorology.

(HOLWAY, VARNEY)

4 hrs., each half-year; 3 units. Tu Th, 10, Th, 1-3.

**ORIENTAL LANGUAGES**

JOHN FRYER, LL.D., Professor of Oriental Languages, Emeritus.

EDWARD T. WILLIAMS, M.A., LL.D., Agassiz Professor of Oriental Languages and Literature.

YOSHI S. KUNO, M.S., Instructor in Japanese.

S. C. KIANG, Assistant in Chinese.

Some of the courses are accepted by the College of Commerce and other colleges as part of their regular curricula or as equivalents for prescribed work. Students who wish to take up these Oriental studies may therefore find it to their advantage to consult with the Dean of their college as to the arrangements that can be made in that direction.

In addition to the lecture and language courses mentioned below, the head of the department will offer special assistance to students who wish to take up other branches of study connected with China and Japan. He will also act as advisor to students coming from or going to the Orient.

**LOWER DIVISION COURSES***Language Courses***3A-3B. Elementary Study of Kuan-hua. (WILLIAMS)**

Introduction to Kuan-hua, the language spoken, with slight variations, by the officials and about four-fifths of the population of China. Series of progressive, elementary lessons and exercises in reading, speaking and translation.

3 hrs., throughout the year. M W F, 9.

**8A-8B. Chinese Conversation for Beginners. (KIANG)**

Practical exercises in the use of Kuan-hua.

3 hrs., throughout the year. M F, 11.

**9A-9B. Elementary Study of the Japanese Language. (KUNO)**

Introduction to the Japanese language, with the use of both the Katakana and Hiragana forms of letters. Series of progressive elementary lessons and exercises in reading, writing, and speaking.

3 hrs., throughout the year, beginning in September or in February. First half-year, M W F, 1; second half-year, M W F, 8.

**9C-9D. Second Year of Elementary Japanese. (KUNO)**

Continuation of 9A-9B, introducing the use of common Chinese characters with selections from Japanese newspapers and modern Japanese authors.

3 hrs., throughout the year, beginning in September or in February. First half-year, M W F, 8; second half-year, M W F, 10.

10A-10B. Chinese Character Writing with Brush and Ink, an Introduction to the Chinese Language. (KIANG)

2 hrs., throughout the year, beginning in September or in February;  
1 unit each half-year. M, 1-3.

12A-12B. Japanese Character Writing. (KUNO)

Instruction in handling the brush, in making the various strokes, in forming the characters, and in different styles of writing.

2 hrs., throughout the year, beginning in September or in February;  
1 unit each half-year. S, 8-10.

### UPPER DIVISION MAJOR COURSES

#### *Language Courses*

\*103A-103B. Elementary Study of the Chinese Written Language, Ancient and Modern. (WILLIAMS)

3 hrs., throughout the year. M W F, 11.

\*104A-104B. Advanced Study of Kuan-hua. (KIANG)

Series of progressive advanced lessons and exercises in reading, speaking, and translation.

3 hrs., throughout the year. M W F, 10.

105A-105B. Elementary Study of the Classics and the Written Language of Japan. (KUNO)

Progressive selections from various kinds of current literature and from standard Japanese classics and poetical works.

2 hrs., throughout the year. Tu Th, 8. Prerequisite: course 110A-110B.

\*106A-106B. Advanced Study of Japanese Classics. (KUNO)

Interpretation of Hōjō-ki, Tsure-zuregusa, and Makura-no-sōshi. May be repeated without duplication of credit.

2 hrs., throughout the year, to be arranged. Prerequisite: course 105A-105B.

107A-107B. Popular Reading Course in Japanese. (KUNO)

Designed primarily for California-born Japanese and students of other nationalities who desire to attain facility in reading modern literature, magazines, and newspapers.

1 hr., throughout the year; 1 unit each half-year. F, 2.

\*108A-108B. Advanced Chinese Conversation. (KIANG)

3 hrs., throughout the year. M W F, 3. Prerequisite: course 8A-8B, or some practice in conversation.

\*Not to be given, 1918-19.

- 110A-110B. Advanced Study of the Japanese Spoken Language. (KUNO)  
 Series of progressive advanced lessons in reading, speaking, writing, translation and composition.  
 3 hrs., throughout the year. M W F, 9. Prerequisite: course 9C-9D.
- 112A-112B. Study of the Chinese Classical Language. (WILLIAMS)  
 Readings from the Four Books, the Five Classics and other standard works. May be repeated without duplication of credit.  
 1 hr., throughout the year. W, 11.
- \*113A-113B. Reading of a Chinese Text. (KIANG)  
 2 hrs., throughout the year. W F, 2.
- 130A-130B. Chinese Composition. (KIANG)  
 Writing of letters and short essays.  
 2 hrs., throughout the year. M F, 1. Prerequisite: some knowledge of the modern written language.

*Lecture Courses*

- 109A-109B. Japan and Her Makers. (KUNO)  
 Prominent historical characters and events will be treated in chronological order, so as to give a general view of the history of Japan. Stress will be placed upon her political and social evolution and the development of her civilization. About 700 pages of outside reading are required in this course.  
 2 hrs., throughout the year. Two sections: I, Tu Th, 9; II, M W, 11. Prerequisite: junior standing or History 1A-1B or Political Science 106.
- \*121A-121B. Commerce and Industry of Japan. (KUNO)  
 The development of commerce and industry in Japan; economic conditions and foreign trade.  
 1 hr., throughout the year. W, 2. Prerequisite: course 109A-109B.
- \*122A-122B. Japanese Religions and Ethics. (KUNO)  
 The development of Shintoism, Confucianism, Buddhism, Christianity, and the modern Ethical System in Japan and their effect on her civilization.  
 1 hr., throughout the year. W, 2. Prerequisite: course 109A-109B.
- \*123A-123B. Japanese Art; Poems and Folk-lore. (KUNO)  
 1 hr., throughout the year. W, 2.

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\*Not to be given, 1918-19.



124A-124B. International Relations of Oriental Countries. (KUNO)

The political and intellectual relations of Japan, China, and Korea, and their diplomatic relations with Occidental powers.

1 hr., throughout the year. W, 2. From 400 to 500 pages of outside reading and a term paper of about 3500 words are required.

NOTE.—Courses 121, 122, 123, and 124 will form a series to be given in successive years.

\*126A-126B. The Religions of China.

2 hrs., throughout the year. M W, 10.

\*127. Chinese Industrial Art.

Continuation of 126A-126B.

1 hr., first half-year. Tu, 9.

128A-128B. The Social and Economic Conditions of China. (WILLIAMS)

The historical, geographical, economic and political features.

3 hrs., throughout the year. M W F, 10.

129A-129B. Chinese History.

(WILLIAMS)

1 hr., throughout the year. M, 11.

150A-150B. The Chinese Great Books.

(KIANG)

Chinese philosophies and general literature.

2 hrs., throughout the year. W F, 2.

GRADUATE COURSES

201A-201B. Oriental Seminar.

(WILLIAMS)

Reviews of new books on China, research work, and reports by the students on assigned subjects.

2 hrs., throughout the year. Tu, 4-6.

203A-203B. Research Work and a Critical Study of Modern Topics and Books on Japan. (KUNO)

Class work will consist of lectures by the instructor and reports by students. May be repeated without duplication of credit.

2 hrs., throughout the year. F, 3-5. Prerequisite: at least senior standing, and the completion of 6 units in upper division courses in the department.

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\*Not to be given, 1918-19.

**PALAEONTOLOGY**

JOHN C. MERRIAM, Ph.D., Professor of Palaeontology and Historical Geology.

BRUCE L. CLARK, Ph.D., Assistant Professor of Palaeontology.

EUSTACE F. FURLONG, Assistant in Palaeontology.

CHESTER STOCK, Ph.D., Research Assistant in Palaeontology.

The field for palaeontologic study and research on the Pacific Coast, and especially in the territory immediately accessible from the University, is a most remarkable one. A large part of the geologic column is exposed and open for study in the region easily reached from the University. Within a radius of twenty-five miles from Berkeley the Coast Range formations, ranging from early Cretaceous to Pleistocene, are represented by splendid exposures containing abundant fossil remains. This section is the basis for regular field work.

Research work in palaeontology has been based largely on a study of the material immediately at hand. Our knowledge of West Coast palaeontology is now in the making, and advanced students are expected to assist in working out some of the problems before us. The collections available for study and comparison in research include a representative series of the invertebrate faunas of California, together with a large quantity of invertebrate material from horizons the position of which are not as yet clearly determined. The vertebrate collections include the original material obtained by the University in progress of work in the John Day region of Oregon; the Virgin Valley, Thousand Creek and Cedar Mountain regions of Nevada; Potter Creek Cave, Samwel Cave, and Hawver Cave of the mountain regions of California; Rancho La Brea, and the Mojave region of Southern California; and the Triassic limestones of Northern California and Western Nevada.

There are no laboratory fees in this department.

**LOWER DIVISION COURSES**

1. General Palaeontology. (MERRIAM)  
Lectures, assigned reading, and written reports. General principles of the study of the history of life.  
2 hrs., first half-year. Tu Th, 10. Preparatory to Geology 1B. Zoology 1A is recommended as preliminary.
2. Demonstration Course. (MERRIAM)  
Demonstration, excursions, conferences, and assigned reading.  
1 hr., first half-year. Two sections: I, Tu, 1; II, Th, 11. Course to accompany course 1.

## UPPER DIVISION MAJOR COURSES

102. Invertebrate Palaeontology. (CLARK)  
A laboratory study with assigned reading on the most important forms of fossil invertebrates, with special reference to the history of life in the Pacific Coast region.  
6 hrs., laboratory, 2 hrs. lecture, first half-year; 4 units. Prerequisite: course 1 completed or in progress.
103. Invertebrate Faunas of the Pacific Coast Region. (CLARK)  
Laboratory and field work on the fossil invertebrate faunas of the Pacific Coast region.  
6 hrs., laboratory, 1 hr. lecture, 3 hrs. field work, second half-year; 4 units. Prerequisite: course 102.
104. Vertebrate Palaeontology. (MERRIAM)  
Osteology, affinities, and history of the principal groups of vertebrates.  
3 hrs. laboratory, 1 hr. lecture or pro-seminar, first half-year; 2 units. Prerequisite: course 1 completed or in progress, or Zoology 1A. The lectures may be taken separately as Palaeontology 104A (1 unit) by students in Zoology 106.
105. History of Vertebrate Life in Western North America (MERRIAM)  
A study of the extinct vertebrate faunas of western North America, with special reference to the most important problems illustrated by the history of these groups.  
3 hrs. laboratory, 1 hr. lecture, 1 hr. pro-seminar, second half-year; 3 units. Prerequisite: course 104.

## PRIMARILY FOR GRADUATES

- 206A-206B. Palaeontologic Seminar. (MERRIAM)  
1 hr., throughout the year; 1 unit each half-year.  
Sec. 1. Invertebrate palaeontology of the Pacific Coast region.  
Sec. 2. Vertebrate palaeontology of the Pacific Coast region.
207. Advanced Vertebrate Palaeontology. (MERRIAM)  
Credit not to exceed 6 units. Laboratory or field work, which may be done either during a session or during vacation periods. The work must be registered for in advance, it must be planned with the instructor in charge, and must be carried on under the direction of the instructor. Work done outside the limits of the fall or spring sessions must be supplemented by a written report.
208. Advanced Invertebrate Palaeontology (MERRIAM and CLARK)  
Credit values, requirements as to place and time for conducting work, and nature of conditions governing final reports arranged on the same basis as for course 207.

### PATHOLOGY AND BACTERIOLOGY

**\*FREDERICK P. GAY, A.B., M.D.,** Professor of Pathology.

**GLANVILLE Y. RUSK, A.B., M.D.,** Associate Professor of Pathology.

**IVAN C. HALL, A.B., M.S.,** Associate Professor of Bacteriology.

**CARL L. A. SCHMIDT, M.S., Ph.D.,** Assistant Professor of Chemical Pathology.

**WILLIAM H. BARNES, A.B., M.S.,** Instructor in Bacteriology.

**\*GRANVILLE S. DELAMERE, A.B.,** Assistant in Pathology.

**DOLORES E. BRADLEY, B.S., M.A.,** Assistant in Bacteriology.

**RUTH L. STONE, M.A.,** Edith Claypole Research Fellow in Pathology.

**Student Assistants.**

*Honor-students in the Upper Division.*—Students in the upper division will be nominated by request to candidacy for honors on the basis of thoroughly satisfactory work in courses 101, 102 and 103. Honors will be recommended only for candidates who present a thesis of high grade covering investigation in course 106 and whose record in other biological subjects is at least thoroughly satisfactory.

15 units in courses 101, 102, 103 and 106 must be included in the major in bacteriology; 9 units of related subjects chosen by consultation with the instructor in charge of the student's work in the department may be applied toward the required 24 units.

### BACTERIOLOGY

#### LOWER DIVISION COURSE

#### 1. General Bacteriology and Microbiology.

(HALL, BARNES, BRADLEY, and Assistants)

History of bacteriology; morphology, classification, ecology and metabolism of micro-organisms; sterilization; preparation of culture media; microscopic examination, cultivation and identification of bacteria; introduction to microbiology of air, water, soil, foods (including milk), industrial processes, and certain human, animal and plant diseases.

9 hrs., second half-year; 4 units. Lectures, Tu Th S, 9; laboratory sections: I, M W F, 10-12; II, M W F, 1-3; III, Tu Th S, 10-12. Prerequisite: Chemistry 1A. Fee, \$10.00. Deposit, \$5.00, subject to refund, less deduction for breakage at end of half-year.

\* Absent on leave for the duration of the war; <sup>1</sup> in residence first half-year only.

## UPPER DIVISION MAJOR COURSES

101. Medical Bacteriology and Protozoology. (HALL, BARNES, BRADLEY)  
History of bacteriology; morphology, classification, ecology and metabolism of micro-organisms; sterilization; preparation of culture media; microscopic examination, cultivation, and identification of bacteria; systematic study of pathogenic micro-organisms.  
12 hrs., first half-year; 4 units. Lecture, M Tu Th F, 1; laboratory, 2-4. Open with the consent of the instructor to non-medical students whose record in course 1 is thoroughly satisfactory. Fee and deposit for non-medical students, same as for course 1.
102. Infection and Immunity: Lectures. (HALL)  
Accessible aspects of functional pathology; evolution of infectious diseases of the body and the mechanism of animal defense; principles of immunology and their applicability in prophylaxis, diagnosis and specific therapy.  
2 hrs., first half-year. M W, 11. Prerequisite for non-medical students: course 1.
103. Infection and Immunity: Laboratory. (HALL and BARNES)  
Experimental methods; demonstrations.  
4 hrs., first half-year; 1 unit. M Tu Th F, 4. Prerequisite for non-medical students; course 1. Fee for non-medical students, \$10.00. This course can not be taken separately from courses 101, 102.
106. Advanced Bacteriology. (HALL)  
Undergraduate research problems.  
Hours and credit to be arranged.
107. Anaerobic Bacteriology. (HALL)  
Historical; practical methods; anaerobes of the air, soil, water, and normal animal body; pathogenic anaerobes and the diseases caused by them.  
6 hrs., second half-year; 2 units. Lectures, W F, 9; laboratory M Tu W F, 10. Prerequisites: courses 101, 102 and 103. Fee, \$5.00. Deposit, \$5.00, subject to refund, less deduction for breakage at end of half-year.

## GRADUATE COURSE

201. Research. (HALL)  
Problems of infection, immunity and microbiology.  
Either half-year. Hours to be arranged.

**PATHOLOGY****UPPER DIVISION MAJOR COURSES**

104. Morbid Anatomy and Histopathology. (RUSK and DELAMERE)  
Changes in organs and tissues in disease in the animal and human body; macroscopic lesions illustrated by fresh material from autopsies and museum specimens. Lectures, conferences, and practice.  
16 hrs., first half-year; 6 units. M W Th S, forenoons.
105. Autopsy Course. (RUSK)  
Third and fourth years in the medical curriculum at the University of California Hospital and at the San Francisco Hospital.

**GRADUATE COURSES**

202. Research. Neuropathology. (RUSK)  
Either half-year. Hours to be arranged.
204. Advanced Morbid Anatomy and Histopathology. (RUSK)  
Autopsy technic and the working up of tissues and cultures resulting from post-mortem examination. Elective for fourth-year and graduate students in medicine.  
Either half-year. University Hospital.
205. Experimental Pathology. (RUSK and DELAMERE)  
Experiments illustrating functional changes as evidenced by chemical and physiological methods and tissue alterations; results demonstrated in course 104. Special problems. Open to qualified students and graduates by special arrangement.
206. Immunochemistry. Seminar. (SCHMIDT)  
Consideration and discussion of the physico-chemical aspects of the subject of immunity. Informal discussion and presentation of current problems.  
First half-year. Hours and credit to be arranged.
207. Research. (SCHMIDT)  
Problems in chemical pathology.  
Either half-year. Hours to be arranged.

(214B)

# PHILOSOPHY

CHARLES H. RIEBER, Ph.D., Professor of Logic.

\*GEORGE M. STRATTON, Ph.D., Professor of Psychology.

GEORGE P. ADAMS, Ph.D., Associate Professor of Philosophy.

WARNER BROWN, Ph.D., Assistant Professor of Psychology.

\*CLARENCE I. LEWIS, Ph.D., Assistant Professor of Philosophy.

JACOB LOEWENBERG, Ph.D., Assistant Professor of Philosophy.

\*JOHN DEWEY, LL.D., Professor of Philosophy, Columbia University;  
Lecturer on the Mills Foundation.

\*WILLIAM E. HOCKING, Ph.D., Professor of Philosophy, Harvard University;  
Lecturer on the Mills Foundation.

OLGA L. BRIDGMAN M.D., Ph.D., Instructor in Mental Abnormalities of  
Childhood, and Instructor in Pediatrics.

EDWARD C. TOLMAN, Ph.D., Instructor in Psychology.

*Honor-students in the Upper Division.*—Candidates will enroll in the honor-course 199. The student's work in this honor-course will be under the supervision of one or more instructors with whom the student is taking a major course. The honor-course will hold stated fortnightly meetings at which time students will report on their work within their chosen field.

## LOWER DIVISION COURSES

Although these courses properly fall within the first two years of undergraduate work, and are prerequisite, as specified below, to the major courses in the upper division, they are all open as free electives to any student in the University, unless restrictions are explicitly stated.

Students who intend to do advanced work in philosophy should take either course 103, History of Philosophy, or 104B, Ethics, in the sophomore year. Both these courses are regularly open to sophomores who intend to take further work in philosophy.

### *Philosophy*

#### 1A. Deductive Logic.

(RIEBER and ADAMS)

Division; definition; the forms and transformations of judgments; the syllogism, and the deductive fallacies.

3 hrs., either half-year. First half-year, M W F, 1 (Rieber); second half-year, M W F, 2 (Adams).

#### 1B. Inductive Logic.

(RIEBER and ADAMS)

The presuppositions and methods of the inductive sciences.

3 hrs., either half-year. First half-year, M W F, 2 (Adams); second half-year, M W F, 1 (Rieber). Prerequisite: course 1A.

\* In residence first half-year only; \* in residence second half-year only;

\* absent on leave for the duration of the war.

**\*1c. Elements of the Logic of Science. (LEWIS)**

Graphic and symbolic methods in logic; typical logical problems common to all branches of scientific procedure.

3 hrs., either half-year. M W F, 1. Prerequisite: course 1A.

The logic-mathematics requirement for the junior certificate may be satisfied by completing 1A and 1B or courses 1A and 1C. But courses 1B and 1C cannot both be counted for credit either toward junior certificate requirements or the bachelor's degree.

*Psychology***2A. General Psychology. (BROWN)**

The facts of consciousness, their relation to one another and to their physical correlates. Demonstrations, lectures, and readings.

3 hrs., first half-year. M W F, 3. The course is not open to freshmen; sophomores on completing this course may elect course 102B.

*Philosophy***40. The Problems of Philosophy. (LOEWENBERG)**

The aim and scope of philosophy; relations to science and religion. Discussion of characteristic problems. Outlines of typical solutions.

2 hrs., first half-year. Tu Th, 11.

**\*45A-45B. Philosophies of Social Relations. (LEWIS)**

A critical survey of the philosophical basis of anarchism, individualism and socialism. Fundamental ethical problems of political and economic organization. For students who have some knowledge of economic and social theory.

2 hrs., throughout the year. Tu Th, 2.

**50A-50B. Political and Ethical Ideals. (ADAMS)**

The development of political and ethical ideals in European civilization from Greek thought to the present time.

2 hrs., throughout the year. Tu Th, 10.

**UPPER DIVISION MAJOR COURSES***Philosophy***103A-103B. History of Philosophy. (RIEBER)**

Critical account in outline, of the course of Occidental thought, with references to the thought of the Orient.

3 hrs., throughout the year. M W F, 2.

**104A. Psychology of Moral Conduct. (DEWEY)**

A consideration of the primary factors of human nature, such as instinct, emotion, desire, reflection, habit, character, in relation to moral values, and of the effect of different estimates of the nature of these factors upon traditional types of moral theories.

3 hrs., first half-year. M W F, 2.

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\*Not to be given, 1918-19.



- 104B. Ethics. (ADAMS)  
Contemporary ethical problems in their social and practical aspects, with special reference to the political and economic organization of society.  
3 hrs., second half-year. M W F, 2.
- 105A. The Kantian Philosophy. (LOEWENBERG)  
3 hrs., first half-year. M W F, 11. Prerequisite: course 103A-103B.
- \*109. Symbolic Logic. (LEWIS)  
Graphic methods in logic, the elements of symbolic logic, and some applications.  
3 hrs., second half-year. M W, 11, and a third hour to be arranged.  
Prerequisite: course 1A.
111. Fundamental Theoretical Problems. (ADAMS)  
A critical and constructive survey of problems touching the nature of consciousness and the self, the relation between mind and body, and the place of human selves in nature.  
3 hrs., first half-year. M W F, 3. Prerequisite: course 103B.
- 112A-112B. Religion. (ADAMS)  
First half-year: The origin and development of religion, the chief types of ideas and practices in the historical religions.  
Second half-year: Analysis and criticism of contemporary interpretations of religion, the truth of religious ideas, and the place of religion in modern life.  
2 hrs., throughout the year. Tu Th, 11.
114. Theory of Knowledge. (RIEBER)  
An intensive study of the morphology of the concepts, the import of propositions, and the principles of inference.  
2 hrs., first half-year. Tu Th, 10. Prerequisite: courses 1A, 1B.
115. Logic of Science. (RIEBER)  
The relation of the other sciences to mathematics and logic; the use of hypothesis in science; modern methods of verification and modern ideas about scientific truth.  
2 hrs., second half-year. Tu Th, 9. Prerequisite: courses 1A, 1B.
- \*116A-116B. Plato. (—)  
3 hrs., throughout the year. M W F, 9. Prerequisite: course 103A-103B. This course may be counted as a major in Greek for students who read the Plato and the Aristotle in the original.

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\*Not to be given, 1918-19.

- \*123. German Idealism after Kant. (LOEWENBERG)  
 Fichte, Schelling and Hegel: the development of the Kantian philosophy in Germany.  
 3 hrs., second half-year. M W F, 1. Prerequisite: courses 103A-103B and 105A.
- \*125. Philosophic Theories of the Nineteenth Century. (LOEWENBERG)  
 Summary account of Fichte, Schelling, Hegel, Schopenhauer, Darwin, Comte, Hill, Spencer, Haeckel, Nietzsche.  
 3 hrs., first half-year M W F, 1. Prerequisite: course 103B.
135. Contemporary Tendencies in Philosophy. (LOEWENBERG)  
 A critical discussion of contemporary realism, idealism, pragmatism, and the philosophy of Bergson.  
 3 hrs., second half-year. M W, alt. F, 11.
- \*138. Continental Rationalism in the Seventeenth Century. (LOEWENBERG)  
 Descartes, Spinoza, and Leibnitz, with some attention to their contemporaries.  
 3 hrs., first half-year. M W F, 1. Prerequisite: course 103A-103B.
- 139A-139B. The Philosophy of Royce. (LOEWENBERG)  
 First half-year: Exposition and interpretation of Royce's Ethics, based upon *The Philosophy of Loyalty* and selections from *The Problem of Christianity*. Second half-year: A detailed study of Royce's conception of reality in relation to realism, mysticism and pragmatism. Text: *The World and the Individual*, Vol. I.  
 2 hrs., throughout the year. Tu Th, 1.
146. Literary Expressions of Philosophic Problems. (LOEWENBERG)  
 Analysis of fundamental philosophic problems through an interpretation of literature. The philosophical and literary theories of idealism, realism, mysticism, romanticism and classicism will be compared and exemplified. Examples will be chosen from English literature as well as from Dante, Goethe, Dostoyevsky, Tolstoy, Ibsen, and others.  
 2 hrs., second half-year. Tu Th, 11.
160. The Philosophy of the State. (HOCKING)  
 The nature of the State, as compared with other social groups; social and political instincts; nationality; principles of international dealing; war and peace; the bases of democracy; theory of right and legislation; property as a right; crime and punishment.  
 3 hrs., second half-year. M W F, 3.

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\*Not to be given, 1918-19.

Psychology

- 102B. Applied Psychology. (BROWN)  
 Certain results of modern psychology bearing upon the work of the lawyer, the physician, the teacher, and the business man.  
 3 hrs., second half-year. M W F, 3. Open to sophomores who have completed course 2A, which is also the prerequisite for upper division students who wish to take this course.
110. Educational Psychology. (BROWN)  
 The process of learning; the acquisition of habits and of skill; association; memory; imitation; reasoning; emotion; tendencies to action; individual differences.  
 3 hrs., first half-year. M W F, 1. Prerequisite: course 2A.
145. Social Psychology. (ADAMS)  
 The basis of social relations and the social aspects of human nature. The application of social psychology to ethical, political, and religious problems.  
 3 hrs., second half-year. M W F, 3.
106. Introduction to Psychological Experiment. (TOLMAN)  
 Sensation, perception, emotion, movement, attention, memory, imagination, habit.  
 4 hrs., first half-year; 2 units. Tu Th, 1-3. Prerequisite: course 2A.
107. Phases of Medical Psychology. (TOLMAN)  
 Experiments illustrating methods of testing and measuring mental processes, particularly the methods employed in applied and clinical psychology.  
 4 hrs., second half-year; 2 units. Tu Th, 1-3. Prerequisite: course 2A.
- \*124A-124B. History of Psychology. (STRATTON)  
 Psychological observations, theory, and method, through early Hindu and Greek thought to the present time.  
 2 hrs., throughout the year. Tu Th, 3. Prerequisite: course 2A.
133. Advanced General Psychology. (TOLMAN)  
 Contemporary discussions of sensation, perception, attention, the self, the will, and related topics. Lectures, recitations, and reports.  
 3 hrs., second half-year. M W F, 9. Prerequisite: course 2A.
- 140A-140B. Psychological Experiments. (BROWN)  
 Special yet connected problems; experiments, reading, and discussions in common.  
 Not less than 6 hrs., throughout the year; 3 units. Units and hours to be arranged with each student, at times within M Tu W Th F, 10-12 and 1-4. Prerequisite: course 106 or 107.

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\* Not to be given, 1918-19.

- \*141A-141B. Psychological Conference. (STRATTON)  
 Reading, with discussion, of selected topics in psychology.  
 2 hrs., throughout the year. Tu Th, 3. Prerequisite: course 2A.
142. Abnormal Psychology of Childhood: Elementary. (BRIDGMAN)  
 A study through lectures, reading, and clinical demonstration, of the more important phases of mental abnormality in children.  
 2 hrs., throughout the year. M W, 4. Prerequisite: courses 2A and 2B.
143. Abnormal Psychology of Childhood: Advanced. (BRIDGMAN)  
 Special problems, with field work.  
 2 hrs., throughout the year. M W, 3. Prerequisite: courses 106 or 107, and 142.
150. Animal Psychology. (TOLMAN)  
 Sensation, perception, and attention in animals; their methods of learning.  
 3 hrs., first half-year. M W F, 2. Prerequisite: course 2A.
- 199A-199B. Honor-course. (The STAFF)  
 Throughout the year. Hours to be arranged.

### GRADUATE COURSES

The qualifications for each course are indicated in its prerequisite. Qualified undergraduates may be admitted by special permission of the officers in charge:

- 211A-211B. Seminar in Logic. (RIEBER)  
 Logic as the method of truth; development and criticism of the leading theories of knowledge.  
 2 hrs., throughout the year. Hrs. to be arranged. Prerequisite: a good knowledge of Kant's critical writings, and of the attempted continuation of his principles by Fichte and Hegel.
- 212A-212B. Ethics Seminar. (ADAMS)  
 Topic for 1918-19: The Philosophy of the State and of Law in German, French and English Thought.  
 2 hrs., throughout the year, to be arranged.
- 213A-213B. Psychological Research. (BRIDGMAN, BROWN, TOLMAN)  
 The investigation of special problems selected with regard to the individual interest of those electing the work; reports and discussions.  
 Prerequisite: course 133 or 140. Units and hours arranged with each student.  
 2 hrs., throughout the year. W, 7:15-9:15 p.m.

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\*Not to be given, 1918-19.

\*215. The Theory of Consciousness: Seminar.

(LEWIS)

2 hrs., second half-year, to be arranged.

225A-225B. Seminar in the History of Philosophy.

(LOEWENBERG)

First half-year: Schopenhauer; second half-year: Nietzsche.

2 hrs., throughout the year. Tu, 7:30-9:30 p.m.

In addition to the foregoing courses, special lines of study will be arranged for qualified graduates who are candidates for higher degrees, or who wish to carry on advanced work.

230. The Philosophy of Education.

(DEWEY)

The discussion will take up various theories of knowledge, empirical, rationalistic, pragmatic, etc., in their bearings upon subject matter and method in education. The aim will be to develop a constructive theory of the nature and function of knowledge in the educational process.

2 hrs., first half-year, to be arranged.

235. Human Instincts and Their Transformation.

(HOCKING)

2 hrs., second half-year, to be arranged.

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\*Not to be given, 1918-19.

**PHYSICAL EDUCATION FOR MEN**

WALTER E. MAGEE, Professor of Physical Culture.

<sup>1</sup>FRANK L. KLEEBERGER, B.S., M.A., Director of Men's Gymnasium and Associate Professor of Physical Education.

FREDERICK W. COZENS, A.B., M.A., Instructor in Physical Education.

EARL H. WIGHT, B.L., Instructor in Physical Education.

MARCUS FREED, Special Assistant in Boxing.

CHARLES W. ANDREWS, Special Assistant in Wrestling.

The prerequisites to advanced work in physical education are Chemistry 1A, Zoology 1A, and Hygiene 3.

*Plan of Prescribed Work.*—All students are examined from time to time, with reference to their health and physical development, and appropriate exercises are prescribed. Intrants are classified for their prescribed work on the basis of physical efficiency, embracing tests of health, strength, endurance, agility, ability to swim, and skill in self-defense. Men qualified for the athletic division may take regular work in any type of sport from golf to football. Men failing so to qualify, but not found defective in any essentials of health or bodily conformation, will meet for gymnastic drill during the first three weeks, and will be gradually assigned, after medical examination and consultation with the director, to work adapted to their specific needs. The aim is to promote such men as quickly as possible into the athletic division. Men showing abnormality of bodily conformation or physical defects of any sort will be classed as "special" and will be given individual work and advice based on the data of medical and anthropometric examination. The requirements in swimming and self-defense which qualify for athletic division standing must be satisfied by all male students before receiving final credit for the two required units of physical education. Exceptions are made only on advice of the University Infirmary. At the end of each college year tests will be held for those who wish to qualify for the honor-division. Details of the physical efficiency test will be found in the official athletic guide of the department.

Under these regulations any of the courses listed as lower division work may be taken in satisfaction of the University requirements of two units in physical education. The letters A and B denote the work as taken for credit during the two terms respectively, of the freshman year, while the letters C and D represent the work done in the same courses when taken for sophomore credit. Two hours' work each week throughout the freshman and sophomore years satisfies this requirement; one-half unit of credit is given for each half-year's work done on this schedule.

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<sup>1</sup> In residence first half-year only.

**LOWER DIVISION COURSES**

- 1A-1B. Gymnastics. (KLEEGER and WIGHT)  
Athletic dancing and setting-up drills, apparatus, and tumbling; in the open air when conditions permit.  
2 hrs., either half-year;  $\frac{1}{2}$  unit. Six sections: M Tu Th F, 10, 2, 3.
- 2A-2B. Special. (KLEEGER)  
Corrective gymnastics; careful attention is given to men with postural defects and abnormal conditions, such as flat-feet, obesity, etc.  
2 hrs., either half-year;  $\frac{1}{2}$  unit. Two sections: M Tu Th F, 2.
- 3A-3B. Track. (COZENS)  
Class instruction, individual coaching, and advice, supplemented by cross-country runnings, games of hare and hound, etc.  
2 hrs., either half-year;  $\frac{1}{2}$  unit. Two sections, M Tu Th F, 3.
- 4A-4B. Rugby Football, Soccer, and Baseball. (COZENS)  
Games played in season under careful direction of coach and assistants.  
2 hrs., either half-year;  $\frac{1}{2}$  unit. Two sections: M Tu Th F, 5.
- 5A-5B. Basket Ball. (WIGHT)  
Practice games throughout the year, with games scheduled against visiting teams at hours outside the regular section meetings. Sections limited to twenty men each.  
2 hrs., either half-year;  $\frac{1}{2}$  unit. Nine sections: M Tu Th F, 10, 11, 2, 3, 5.
- 6A-6B. General Recreation. (COZENS and WIGHT)  
Handball, tennis, playground baseball, volley-ball, basket ball, field hockey, golf, and cross-country walking.  
2 hrs., either half-year;  $\frac{1}{2}$  unit. Eight sections: M Tu Th F, 8, 9, 10, 11. Tennis, mornings only.
- 7A-7B. Elementary Boxing. (FREED)  
First principles of position, footwork, and blows.  
2 hrs., either half-year;  $\frac{1}{2}$  unit. Eight sections, limited to thirty men in each: M Tu Th F, 10, 11, 2, 3.
- 8A-8B. Elementary Wrestling. (ANDREWS)  
Preparatory exercises for special development, various holds, their counters, and general theory of weight control.  
2 hrs., either half-year;  $\frac{1}{2}$  unit. Eight sections: M Tu Th F, 9, 10, 11, 3.

## 9A-9B. Elementary Fencing.

(———)

Class exercise in single stick, broad sword, foil, and bayonet, followed by practice in personal combat. Men must supply their own swords, plastrons, and gloves.

2 hrs., either half-year;  $\frac{1}{2}$  unit. Two sections, limited to thirty men in each. M F, Th F, 5.

## 10A-10B. Swimming.

(———)

Personal instruction in various strokes as well as class drills in special exercises arranged to facilitate and strengthen necessary co-ordinations. Demonstrations and practice in methods of rescue and resuscitation. Instruction in the principles of diving.

2 hrs., either half-year;  $\frac{1}{2}$  unit. Six sections: M Tu Th F, 2, 3, 4.

## UPPER DIVISION MAJOR COURSES

## 100A. Physiology and Hygiene of Exercise.

(KLEEBERGER)

The physiology of muscle tissue with special reference to the influence of various types of exercise upon nutrition, circulation, respiration, and nerve function. A discussion of the hygienic significance of diet, ventilation, personal habits, and general surroundings to convalescence and health. The physiological action of hydrotherapy, balneotherapy, electrotherapy, and massage, in the treatment of scar tissue, ankylosed joints, inflammations, and mental disorders.

1 hr., second half-year. Tu, 1. Prerequisite: Physiology 1 or 107.

## 106A. Athletic Supervision.

(COZENS and WIGHT)

Technique of organization in all types of institutions and tournaments, athletic meets, leagues, and series; coöperation with school systems and their adaptation in stimulating the interest of large numbers in recreational sport. Intra-mural sports, class athletics, and school athletics. Educational analysis and ideals; significance in moral education. Two lecture or recitation periods; two field periods.

4 hrs., first half-year; 2 units. M Tu W F, 1.

## \*107A. Organization and Management of Playgrounds.

The development and meaning of the playground and recreational movement; recreational surveys; adaptation to community needs; coöperation with existing organizations; qualifications and duties of directors; playground construction.

1 hr., first half-year. Th, 1.

## \*107B. Practical Conduct of Playground Activities.

Details of organization and direction with reference to educational, moral, athletic, dramatic and social phases; technique of group, team, and individual games; organization and conduct of leagues, meets, and daily routine work. Demonstration and actual conduct of games and leagues will be carried on at the Play Center.

1 hr., second half-year. Th, 1.

\*Not to be given, 1918-19.



110A-110B. The Practice of Teaching. (KLEEBERGER and STAFF)

Students may work under supervision as assistants in the playground, campfire, and scouting activities of Oakland and Berkeley. Men may serve also in the athletic and gymnastic activities of the men's department at the University. Conferences will be held with the instructors in charge of the assigned activities, and reports of the work done will be submitted at the end of each half-year.

Hours to be arranged.

111A-111B. Advanced Gymnastics. (KLEEBERGER)

Heavy apparatus, rings, and mats.

4 hrs., throughout the year; 1 unit each half-year. M Tu Th F, 5.

Prerequisite: course 1A-1B or the consent of the instructor.

112A-112B. Advanced Boxing, Wrestling, or Fencing.  
(ANDREWS and FREED)

Three divisions, one for each of the above activities.

4 hrs., throughout the year; 1 unit each half-year. M Tu Th F, 5.

Prerequisite: courses 7AB, 8AB, 9AB, or the consent of the instructor.

**PHYSICAL EDUCATION FOR WOMEN**

\*MAUDE CLEVELAND, M.A., Assistant Professor of Physical Education.  
 RUTH ELLIOTT, A.B., Director of the Women's Gymnasium and Instructor  
 in Physical Education.

ELSIE BLANCHARD, A.B., M.D., Assistant Professor of Physical Education.

EDNA L. ROOF, B.L., Instructor in Physical Education.

FLORENCE EISENHARDT, Instructor in Physical Education.

MARY WOODFORD, A.B., Instructor in Physical Education.

MILDRED LEMON, A.B., Instructor in Physical Education.

FRANCES WHITTLESEY, Assistant in Physical Education.

**LOWER DIVISION COURSES**

*Prescribed Courses.*—The requirement for the junior certificate includes two hours of work during the freshman year, two hours of work during the sophomore year, and, for students whose physical condition is average or above, proficiency in swimming. A physical examination is given to all intrants at the time of the medical examination in September, and freshmen are assigned according to general physical condition to courses 52A-52B, 53A-53B, or 54A-54B. Students entering in February will, if their physical condition permits, be assigned to Sections X and XI of course 52A-52B. Completion of any of these courses with its sophomore continuation will satisfy the requirement for the junior certificate. However, courses 52A-52B, 52C-52D, are prerequisite to all upper division work in the department.

**UPPER DIVISION MAJOR COURSES**

*Honor-students in the Upper Division.*—Students who undertake honor-work in physical education must have a fair degree of motor control, a sense of rhythm, and must be without organic disease or functional disorder. The following courses are prerequisite to honor-work in physical education; Anatomy 102, Hygiene 3 or 107, Physiology 1 or 107.

The normal requirement for honor-students includes the following courses: Physical Education for Men 100A; Physical Education for Women 151, 152, 165A, 165B, 175, 160A-160B or 161A-161B.

All theoretical courses in the department of physical education for women are open to men; all theoretical courses in the department of physical education for men are open as elective courses to women.

To maintain candidacy students must fulfill the requirement for a major in an allied science subject—anatomy, hygiene, physiology, public health, or zoology, as well as in physical education, and must carry out in a satisfactory manner a programme approved by the department.

\* Absent on leave for the duration of the war.

Students who receive the junior certificate with honorable mention, may, upon application, become candidates for honors at graduation. Honors at graduation will be awarded upon the quality of special work undertaken by the student and upon the quality of practical and theoretical work in the department.

Honor-students will be given special opportunity for research in this department in connection with allied departments such as anatomy, education, hygiene, physiology, psychology, and zoology. In addition they will be allowed opportunities for specialization in educational gymnastics in connection with public school teaching, in corrective gymnastics at the orthopedic clinic of the University of California Medical School, and in athletic supervision in connection with department instruction.

**Reconstruction Aides.**—The medical authorities of the United States Army desire that women be specially trained as reconstruction aides to work in conjunction with physical reconstruction work in military hospitals and other institutions authorized by the War Department, and thereby assist in the physical rehabilitation of the wounded men.

Physical reconstruction may be defined as "the completest form of medical and surgical treatment, carried to the point where maximum functional restoration, mentally and physically has been secured." In that this treatment of disease and injury embraces not only anatomical but functional restoration, the continued treatment requires the use of physical therapy. Physical therapy moreover includes physical exercises of all kinds, active and passive, massage, hydrotherapy and electrotherapy.

The training includes instruction in anatomy, physiology, hygiene, psychology, physical education, with special instruction in corrective gymnastics, massage and physical therapy, and practical demonstrations in orthopedic clinics.

In response to this call for specially trained women, the Department of Physical Education for Women offers to students whose major is physical education and to others specially qualified, courses 155 and 156 for the training of reconstruction aides.

### LOWER DIVISION COURSES

#### 52A-52B. Prescribed Course for Freshmen. (ROOF, WOODFORD, WHITTLESEY)

Required of all undergraduate women not enrolled in courses 53A-53B or 54A-54B during the first year of their attendance at the University.

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. Ten sections: I, Tu Th, 11; II, Tu Th, 10; III, Tu Th, 10; IV, Tu Th, 9; V, Tu Th, 3; VI, Tu Th, 3; VII, W F, 10; VIII, Tu Th, 11; IX, W F, 2; X (primarily for students entering in January), M W, 9; XI (primarily for students entering in January), Tu Th, 4.

#### 52C-52D. Prescribed Course for Sophomores.

(EISENHARDT, ROOF, WOODFORD, LEMON, WHITTLESEY)

Required of all undergraduate women not enrolled in courses 53C-53D or 54C-54D during the second year of their attendance at the University.

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. Eight sections: I, M W, 11; II, M F, 10; III, M W, 3; IV, Tu Th, 9; V, M W, 2; VI, M F, 9; VII, W F, 9; VIII, Tu Th, 2. 52D-X, Tu Th, 4. Pre-requisite: course 52A-52B.

## 53A-53B. Corrective Gymnastics.

(BLANCHARD)

Required instead of course 52A-52B of first-year students whose medical and physical examinations indicate the need of corrective exercises.

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. Six sections: I, M W, 9; II, M W, 10; III, Tu Th, 9; IV, Tu Th, 10; V, M W, 2; VI, M W, 3.

## 53C-53D. Corrective Gymnastics.

(BLANCHARD)

Required instead of course 52C-52D of second-year students whose medical and physical examinations indicate the need of corrective exercises.

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. I, M W, 11; II, Tu Th, 11. Prerequisite: course 53A-53B.

## 54A-54B. Restricted Exercise.

(WHITTLESEY)

Required instead of course 52A-52B of first-year students whose medical and physical examinations indicate the need of restricted work.

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. Tu Th, 2.

## 54C-54D. Restricted Exercise.

(LEMON)

Required instead of course 52C-52D of second-year students whose medical and physical examinations indicate the need of restricted work.

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. Tu Th, 10. Prerequisite: course 54A-54B.

## ELECTIVE COURSES

## 55A-55B. Corrective Gymnastics.

(BLANCHARD)

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. Hours to be arranged with instructor. Prerequisite: courses 53A-53B, 53C-53D.

## 60A-60B. Folk Dancing.

(EISENHARDT)

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. Tu Th, 11. Open to juniors and seniors. Prerequisite: courses 52A-52B, 52C-52D.

## 60C-60D. Folk Dancing.

(EISENHARDT)

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. M W, 3. Prerequisite: course 60A-60B.

## 61A-61B. Classic Dancing.

(EISENHARDT)

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. M W, 2. Open to juniors and seniors. Prerequisite: courses 52A-52B, 52C-52D.

## 61C-61D. Classic Dancing.

(EISENHARDT)

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. Tu Th, 3. Prerequisite: course 61A-61B.

**64. Dancing.**

Partheneia practice. Second half-year. No credit. Hours to be arranged. Prerequisite: for freshmen, enrollment in course 52A-52B; for students other than freshmen, one course in dancing in the department.

**65A-65B. Gymnastics.**

(ELLIOTT)

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. Prerequisite: courses 52A-52B, 52C-52D. M W, 11.

**65C-65D. Gymnastics.**

(ELLIOTT)

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. W F, 10. Prerequisite: course 65A-65B.

**66A-66B. Gymnastics.**

(ELLIOTT)

2 hrs., throughout the year;  $\frac{1}{2}$  unit each half-year. W F, 10. Prerequisite: courses 65A-65B, 65C-65D.

**\*74A-74B. Swimming.**

(—)

2 hrs., throughout the year, to be arranged. No credit. Sections: I, advanced; II, intermediate; III, elementary.

**84A-84B. General Recreative Course.**

(ROOF)

2 hrs., throughout the year. M W, 5. No credit. Open with the consent of the instructor to students not taking other work in the department and to women of the faculty, also to women employees of the University.

**UPPER DIVISION MAJOR COURSES**

**151. Kinesiology.**

(ROOF)

3 hrs., first half-year; 3 units. M W F, 1. Prerequisite: Anatomy 102.

**152. Theory and Practice of Corrective Gymnastics.**

(BLANCHARD)

2 hrs., second half-year; 2 units. Prerequisite: course 151.

**153A-153B. Practice of Corrective Gymnastics.**

(BLANCHARD)

2 hrs., throughout the year; 1 unit each half-year. Prerequisite: course 152.

**155. Theory and Practice of Massage.**

(BLANCHARD)

1 hr., either half-year; 1 unit. M, 8. Practice hours to be arranged. Prerequisite: courses 151, 152.

\* Not to be given, 1918-19.

- 156A-156B. Theory and Practice of Physical Therapy. (BLANCHARD)  
Its relation to the problem of the reconstruction and re-education  
of the disabled soldiers and sailors.  
3 hrs., throughout the year; 3 units each half-year. M W F, 1, and  
clinical hours to be arranged. Prerequisite: courses 151, 152, 155,  
and the consent of the instructor.
- 160A-160B. Theory and Practice of Teaching Folk Dancing. (EISENHARDT)  
1 hr., throughout the year; 1 unit each half-year. F, 8. Prerequisite:  
course 60A-60B.
- 161A-161B. Theory and Practice of Teaching Classic Dancing.  
(EISENHARDT)  
1 hr., throughout the year; 1 unit each half-year. W, 8. Prerequisite:  
course 61A-61B.
- 165A-165B. Theory and Practice of Gymnastic Teaching. (ELLIOTT)  
2 hrs., throughout the year; 2 units each half-year. Tu Th, 8. Pre-  
requisite: courses 65A-65B, 151, and consent of the instructor.
170. Theory and Practice of School and Playground Games. (———)  
2 hrs., second half-year. M W, 8.
171. Theory and Practice of Athletic Supervision. (The STAFF)  
1 hr., either half-year. Th, 1. Prerequisite: a working knowledge of  
at least two team games.
175. Theory and History of Physical Education and Recreation.  
(ELLIOTT)  
3 hrs., second half-year. M W F, 3. Prerequisite: course 165A-165B.

## GRADUATE COURSES

250. Seminar. (The STAFF)  
Topic for the year 1918-19: Current tendencies in physical education.  
Second half-year. Hours to be arranged. Prerequisite: course 175.
265. Studies in Gymnastic Teaching. (ELLIOTT, ROOF)  
Hours to be arranged. Prerequisite: course 165B. Recommended in  
connection with Education 201.

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\* Not to be given, 1918-19.

## PHYSICS

FREDERICK SLATE, B.S., Professor of Physics, Emeritus.

E. PERCIVAL LEWIS, Ph.D., Professor of Physics.

WILLIAM J. RAYMOND, B.S., Associate Professor of Physics.

RALPH S. MINOR, Ph.D., Associate Professor of Physics.

ELMER E. HALL, Ph.D., Associate Professor of Physics.

RAYMOND B. ABBOTT, M.S., Instructor in Physics.

\*WENDELL, P. ROOF, A.B., Instructor in Physics.

\*LLOYD T. JONES, Ph.D., Instructor in Physics.

RAYMOND T. BIRGE, Ph.D., Instructor in Physics.

WILLIAM H. BAIR, M.S., Instructor in Physics.

WILLIAM R. STAMPER, Mechanician.

OSWALD G. STEINITZ, Mechanician.

Fifteen Assistants.

Courses 1A-1B to 3A-3B are fundamental and designed to meet the needs of students preparing for applications of physics, or advanced work in the subject itself. The physical laboratory will be open six days a week throughout the year, and may be used, under the guidance of the instructors concerned, by advanced students. The equipment of the laboratories is modern and extensive, and the University Library contains complete sets of all the important physical journals, and the proceedings and transactions of most of the academies and other societies.

The laboratory *deposit* for courses 1A, 1B, 3A, and 3B is \$10 each; for courses 2C and 2D, \$5 each; for course 1AB, \$15; and for other courses at the rate of \$5 a half-year for each laboratory exercise a week, but no deposit or fee is required for the research courses 216, 218. The *fees* are: For courses 1A or 1B, \$6; for 3A or 3B, \$8; for 2C or 3D, \$4; for 1AB, \$12; for other courses \$3 per laboratory unit per half-year. These amounts plus payment for special damage are deducted from the deposits and the balance is returned.

Students who choose upper division courses in physics must include an adequate amount of laboratory exercises in the work chosen; the instructors should be consulted on this point. Students who are preparing to specialize in physics should guide their work by these general suggestions: (1) The preferable choice for the prerequisite in physics is courses 2A-2B, 3A-3B. (2) It is advantageous to include courses 104A and 105A in any plan, because they give control of fundamental methods. (3) Selection among major courses in physics is limited in range, unless a foundation has been laid in differential and integral calculus. (4) Proper access to references cannot be had without ability to read physics in French and German. (5) On special questions affecting individual cases confer early with members of the department concerned in the major courses likely to be selected.

\* Absent on leave for the duration of the war.

*Honor-students in the Upper Division.*—No separate courses are given for honor-students. Provision is made for instruction of a special character in the cases of individuals who seem prepared and inclined to profit by it. See course 119-119B.

### LOWER DIVISION COURSES

#### 1A-1B. General Physics.

(MINOR, BIRGE, BAIR)

Mechanics, properties of matter and heat. Lectures, recitations, and laboratory exercises, each once a week.

4 hrs., throughout the year; 3 units each half-year. Lecture: Sec. A, Tu, 9; Sec. B, W, 1; Sec. C, Th, 9. Recitation sections: 1, 2, 3, 4, M, 1; 5, 6, 7, 8, Tu, 9; 9, 10, Tu, 11; 11, 12, W, 8; 13, 14, 15, 16, Th, 9; 17, 18, Th, 11; 19, 20, 21, 22, F, 1; 23, S, 8; 24, S, 9. Laboratory sections: I, M, 2-4; II, Tu, 10-12; III, Tu, 2-4; IV, W, 2-4; V, Th, 10-12; VI, Th, 2-4; VII, F, 2-4; VIII, S, 10-12. Prerequisite: matriculation subject 11. Prescribed in the colleges of engineering and chemistry, and in the school of architecture. Open to other students by special permission.

#### 1AB. General Physics.

(MINOR, BIRGE, BAIR)

Identical in scope and subject matter with course 1A-1B, but intended for students entering in February, 1919. Other students to be admitted by special permission only.

8 hrs., second half-year; 6 units. Lectures, M Th, 8. Recitation sections: 1, Tu F, 8; 2, W S, 8. Laboratory sections: I, M F, 2-4; II, Tu Th, 2-4.

#### 2C-2D. General Physics.

(MINOR, HALL and ABBOTT)

Magnetism, electricity, wave motion, sound and light, presented as a continuation of course 1A-1B. Two lectures and one laboratory exercise each week.

5 hrs., throughout the year; 3 units each half-year. Lectures: Sec. A, W F, 8; Sec. B, W F, 10. Eight laboratory sections: M Tu W Th F, 1-4; Tu Th S, 9-12. Prescribed in the colleges of engineering and chemistry.

#### 2A-2B. General Physics.

(LEWIS)

Lectures with experimental illustration and problems. Properties of matter, mechanics, heat, sound, light, electricity, and magnetism.

3 hrs., throughout the year. Prerequisite: matriculation subject 11, which may be waived in cases of distinct merit. Some knowledge of plane trigonometry is desirable. Sec. I, elective in the College of Letters and Science, M W F, 3; Sec. II, primarily for pre-medical students, Tu Th S, 11.

#### 3A-3B. Physical Measurement.

(MINOR)

Experimental work in mechanics, properties of matter, heat, sound, light, electricity, and magnetism, requiring quantitative results. Methods are selected so as to show instructive relations of physical principles, and their adaptation to practice problems. Laboratory exercises twice a week. These courses are usually taken in conjunction with 2A-2B. Prerequisite: matriculation subject 11.

6 hrs., throughout the year; 2 units each half-year. Sec. I, M F, 1-4; II, Tu Th, 1-4; III, W, 1-4; S, 8-11.



18. Special Undergraduate Study.

(MINOR)

All special work of lower division grade. Credit value to be fixed in each case. By special arrangement this course may be made the equivalent of parts of the regular work under courses 1A-1B, 2C-2D, 3A-3B.

Courses assigned to "The Staff" in what follows are in charge of a committee of which Mr. E. P. Lewis is chairman. Students who plan to enter any of these courses are directed to confer with him before enrolling.

Courses 118, 119A-119B, and 219A-219B are laid out by special agreement and designed to introduce capable students to advanced topics, in preparation for the systematic study which is the aim of the upper division and the graduate work.

UPPER DIVISION MAJOR COURSES

104A-104B. Physical Laws in Terms of Vector Analysis.

(RAYMOND)

An introduction to vector methods, developing them in connection with their application to selected physical problems.

2 hrs., throughout the year. M F, 8.

105A-105B. Analytic Mechanics.

(RAYMOND)

The mathematical treatment of principles of dynamics that are fundamental, illustrated by problems and applications.

3 hrs., throughout the year. M W F, 9. Prerequisite: the equivalent of matriculation physics, and some working power in differential and integral calculus.

106. Historical Development of Physical Ideas.

(MINOR)

Some critical epochs; the turning-points in experimental evidence and the logic of the conclusions drawn from it.

2 hrs., second half-year. Tu Th, 11.

107A-107B. Electrical Measurements.

(RAYMOND)

The principles of electricity and magnetism, with applications to the measurement of magnetic field, direct and alternating electric current, electro-motive force, resistance, power, illumination, magnetic permeability and the energy losses in iron, electric capacity, inductance and impedance. Calibration and use of the more important types of measuring instruments.

107A. Two lectures and one laboratory exercise a week.

5 hrs., first half-year; 3 units. Lectures, Tu Th, 10; laboratory sections: I, Tu, 1-4; II, W, 1-4. Prerequisite: course 2C-2D, Mathematics 9 and 109 or 3-4.

107B. One lecture and two laboratory exercises a week.

7 hrs., second half-year; 3 units. Lectures, W, 10. Laboratory sections: I, M F, 1-4; II, Tu Th, 1-4. Prerequisite: course 107A.

## 108. Physical Optics.

(HALL)

Lectures with experimental illustrations and recitations, on selected topics in light, relating to the theory of optical instruments.

2 hrs., first half-year. Tu Th, 11. Prerequisite: course 2A-2B and Mathematics 9.

## 108A. Polarized Light.

(MINOR)

Laboratory work, with occasional lectures. Methods of producing and detecting plane, circularly, and elliptically polarized light. Practical applications in crystallography, saccharimetry, and metallic reflection. Optical activity.

6 hrs., second half-year; 2 units. Prerequisite: courses 2A-2B, and 3A-3B, or their equivalents.

## \*109. Properties of Matter.

(———)

Lectures, discussions and problems on gravitation, elasticity, compressibility, capillarity, viscosity, diffusion and rudiments of kinetic theory.

2 hrs., first half-year. Prerequisite: course 1A-1B or its equivalent, and a working knowledge of calculus.

## \*110A-110B. Electricity.

(RAYMOND)

Elementary theory of magnetism and electricity, illustrated with problems and applications. One lecture or recitation and two laboratory exercises each week.

7 hrs., throughout the year; 3 units each half-year. Lectures, W, 9; laboratory, Tu W, 2-4. Prerequisite: the equivalent of course 2A-2B and working power in differential and integral calculus.

## 111-111C. Electric Discharges through Gases.

(LEWIS)

111. Lectures, experimentally illustrated, on phenomena of the flame and electric arc, spark, and vacuum tube; and on cathode rays, Röntgen rays, and radio-activity.

2 hrs., first half-year. M W, 11. Prerequisite: course 2A-2B. This course is recommended as preliminary to course 211-211C.

111C. Laboratory work supplementing course 111 by the individual study of experimental problems.

3 or 6 hrs., first half-year; 1 or 2 units.

## \*112A. Energetics.

(HALL)

A non-mathematical account of forms and transformations of energy. Lectures open to qualified students.

2 hrs., second half-year. Tu Th, 11.

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\*Not to be given, 1918-19.

- 112B. Pyrometry and Heat Measurements.** (HALL)  
 Selected problems in pyrometry and heat measurements, adapted for students in physics, chemistry and engineering. Laboratory work with readings and discussions.  
 6 hrs., second half-year; 2 units. Tu Th, 1-4.
- 113. Physical Optics.** (HALL)  
 Laboratory exercises connected with course 108, and in extension of it.  
 6 hrs., first half-year; 2 units. Tu Th, 1-4.
- 114. Sound.** (RAYMOND)  
 Laboratory work with occasional lectures and discussions. An experimental treatment of sound sources, and of progressive and stationary waves of sound.  
 6 hrs., second half-year; 2 units. Prerequisite: the equivalent of course 2A-2B, and working power in differential and integral calculus.
- 115A-115B. Laboratory Technique.** (—)  
 General ideas underlying the construction and adaptation of apparatus for research. Adjustments and laboratory technique, including glass-blowing.  
 3 hrs., throughout the year; 1 unit each half-year. Th, 1-4.
- 118A-118B. Special Undergraduate Study.** (The STAFF)  
 All special laboratory work of upper division grade not included in courses announced above. Credit value to be fixed in each case.
- 119A-119B. Special Undergraduate Study.** (The STAFF)  
 Selected topics for reading, intended primarily for honor-students.  
 Throughout the year. Credit to be arranged.

# GRADUATE COURSES

- 206A-206B. Harmonic Motion, Electric Waves, and Oscillations.** (RAYMOND)  
 The analytical treatment of vibratory and wave motion, with application to sound, light, and electricity. Lectures with experimental illustrations.  
 2 hrs., throughout the year. Tu Th, 8. Prerequisite: courses 2A-2B and 105A-105B, or their equivalents.
- 211-211C. Spectroscopy.** (LEWIS)  
 211. Lectures, with experimental illustrations, on methods and results of investigation, and spectroscopic theories.  
 2 hrs., second half-year. Prerequisite: course 108. Course 111 will also be found helpful.
- 211C. Laboratory work for students who wish to familiarize, themselves with the use of spectroscopic apparatus, or to supplement course 211 by the individual study of experimental problems.**

212. Lectures on Thermodynamics. (HALL)  
2 hrs., first half-year. Tu Th, 10.
213. The Kinetic Theory of Matter. (HALL)  
Lectures, discussions, and readings on the topics: kinetic theory of gases, equation of condition of vapors and liquids; specific heats; metallic conduction; and the application of kinetic theory to electrical problems.  
2 or 3 hrs., either half-year. Prerequisite: courses 105A-105B, and 111.
- \*215. Dynamics of Rotation. (RAYMOND)  
Theory of the gyroscope, and related problems.  
3 hrs., first half-year. M W F, 11. Prerequisite: courses 104A, 105A-105B.
- \*215A. Precession and Nutation. (———)  
2 hrs., first half-year. M W, 11, in alternate years with course 215.  
Prerequisite: course 215.
- 216A-216B. Special Advanced Study and Research. (Research Course.) (The STAFF)  
Laboratory work throughout the year, on problems of an advanced nature. Credit value to be fixed in each case.
- 217A-217B. Readings and Discussions on Electron Theory and Theory of Radiation. (LEWIS)  
2 hrs., throughout the year. Tu Th, 9.
- 218A-218B. Graduate Laboratory Work. (Research Course.) (The STAFF)  
Throughout the year. Credit to be arranged individually.
- 219A-219B. Special Graduate Study. (The STAFF)  
Selected topics for reading. In recent years the special topics thus treated were selected within the range of thermodynamics, hydrodynamics, physical optics, heat conductivity, kinetic theory, connections of relativity with standard dynamics.  
Throughout the year. Credit to be arranged individually.
220. Teachers' Course. (HALL)  
A seminar designed for prospective teachers of physics.  
3 hrs., second half-year. Tu Th S, 11.

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\*Not to be given, 1918-19.

**PHYSIOLOGY**

SAMUEL S. MAXWELL, Ph.D., Associate Professor of Physiology.  
THEODORE C. BURNETT, M.D., Assistant Professor of Physiology.  
ROSALIND WULZEN, Ph.D., Instructor in Physiology.  
LILLIAN M. MOORE, Ph.D., Instructor in Physiology.  
JOHN A. LARSON, M.A., Instructor in Physiology.  
E. S. MAY, M.D., Assistant in Physiology.  
DOLORES GIBSON, A.B., Assistant in Physiology.

Courses 1 and 2 are designed to meet the needs of students who wish to obtain an elementary knowledge of the subject matter and methods of physiology. While no prerequisite is insisted upon, students who have not had the equivalent of matriculation chemistry will find themselves at a disadvantage.

*Honor-students in the Upper Division.*—Honor-students in physiology should be prepared in physics and inorganic and organic chemistry. They should also have some knowledge of human or comparative anatomy. The following courses will be required: Physiology 1, 2, 108A–108B, 109A–109B, and 110 or 111A–111B; Zoology 1A, 1B may be substituted for Physiology 2. The following courses will be acceptable as a part of the requirement of 24 units in physiology if presented by the student in a programme approved by the department: Anatomy 101, 102, 103; Biochemistry 101; Chemistry 100, 102A, 110, 111; Hygiene 108A–108B; Philosophy 106, 107, 142, 153; Physical Education for Women 165, 175; Physical Education for Men 102AB; Zoology 103, 104, 106, 108.

Honor-students will be given special facilities and guidance in all courses, especially in course 111.

The equipment in the Rudolph Spreckels Physiological Laboratory comprises in addition to the apparatus and conveniences for the customary lines of work in mammalian physiology, facilities for research in general physiology and experimental biology. The department library contains complete sets of all the important physiological journals, and the more important monographs on physiological and related subjects.

**LOWER DIVISION COURSES****1. Introductory Physiology.****(BURNETT)**

A general outline of physiology with special reference to the human; designed for non-medical students. This course is introductory to all other work in the department except course 107.

8 hrs., first half-year; 4 units. Lectures, Tu Th, 1; laboratory, three sections: I, Tu Th, 2–5; II, M F, 1–4; III, W, 1–4, S, 8–11.

## 2. Introductory Biology.

(WULZEN)

General survey of the field of biology, with experimental work on various life phenomena. Free elective.

8 hrs., second half-year; 4 units. Lectures, Tu Th, 10; laboratory: Sec. I, M W, 1-4; Sec. II, Tu Th, 1-4.

## UPPER DIVISION MAJOR COURSES

## 104. Physiology.

(MAXWELL, BURNETT and MOORE)

Physiology of muscle, nerve, central nervous system and sensation, circulation, respiration, and secretion.

21 hrs., second half-year; 10 units. Lectures, M Tu W Th S, 11; F, 10. Laboratory, M Tu W Th S, 8-11. Prerequisite: Anatomy 101. For students matriculated in the Medical School.

## 107. Physiology.

(BUENETT)

A general course in human physiology for students in public health.

8 hrs., first half-year; 4 units. Lectures, Tu Th, 8; laboratory, Tu Th, 9-12. Prerequisite: Anatomy 102, Chemistry 1A-1B.

## 108A-108B. Physiology, Human and Comparative.

(MAXWELL)

(A) Physiology of muscle, nerve, the central nervous system and the special senses. (B) Physiology of the circulation; respiration, digestion, nutrition and reproduction.

3 hrs., throughout the year. M W F, 9. Prerequisite: Physics, Chemistry, Physiology 1, Physiology 2 or Zoology 1B.

## 109A-109B.

(MAXWELL and LARSON)

Laboratory course supplementary to 108A-108B.

6 hrs., throughout the year; 2 units each half-year. Tu Th, 9-12.

## 110. Experimental Biology.

(WULZEN)

Experimentation on cell processes and the tropic reactions.

6 hrs., first half-year; 2 units. Hours to be arranged. Prerequisite: course 2 or Zoology 1A, 1B and matriculation chemistry.

## 111A-111B. Special Laboratory Work.

(The STAFF)

Students who have completed satisfactorily a sufficient amount of advanced work may take up special laboratory or research problems under the direction and supervision of some member of the staff.

6 to 9 hrs., throughout the year; 2 or 3 units. Hours and units must be arranged in advance.

113. Physiology of Infancy. (WULZEN)  
 The normal infant; its various physiological processes, as digestion, sensation, growth.  
 2 hrs., first half-year. Tu Th, 11. Prerequisite: a knowledge of human physiology equivalent to that obtained in course 1.
115. The Physiology of Exercise. (MAXWELL and ———)  
 Laboratory practice with occasional informal lectures. The class will be limited to six members who will be selected on the basis of interest and preparation. The effects of exercise on the physiological processes; practice in the use of the ergograph, the plethysmograph; measurement of blood pressure and respiratory quotient.  
 6 hrs., first half-year; 2 units. M W F, 10-12.
- \*116. Physiology in Secondary Schools. (MAXWELL)  
 Purpose, content and methods of physiology in secondary schools.  
 1 hr., first half-year. M, 4.

#### GRADUATE COURSES

212. Research in Physiology. (MAXWELL and BURNETT)
214. Journal Club. (The STAFF)  
 Discussion of important advances in physiology, reports of research in the department, and abstracts of current papers. Open only to advanced students who have a reading knowledge of French and German. Application for membership should be made to Mr. Maxwell.  
 1 hr., first half-year. Tu, 5.

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\*Not to be given, 1918-19.

**POLITICAL SCIENCE**

\*DAVID P. BARROWS, Ph.D., LL.D., Professor of Political Science.

BERNARD MOSES, Ph.D., LL.D., Professor of History and Political Science, Emeritus.

EDWARD ELLIOTT, Ph.D., Professor of International Law and Politics.

THOMAS H. REED, A.B., LL.B., Associate Professor of Municipal Government.

LUDWIK EHRLICH, D.Jur., B.Litt., Lecturer in Political Science.

\*J. R. DOUGLAS, Ph.D., Instructor in Political Science.

The general prerequisites to courses in the upper division are Political Science 1A and 1B or satisfactory equivalents.

*Honor-students in the Upper Division.*—The department of political science will give honors on the basis of 24 units of work under its control, most of which must be passed with first and second grades. A certain amount of it may be taken in jurisprudence, history, economics or possibly even in other departments. The bulk of it should be chosen from upper division courses in political science. There will not be a rigid prescription of courses, but each applicant's course of studies will be considered on its merits. This should be made up, as completely as possible, at the beginning of the junior year, in consultation with the member of the department designated as Supervisor of Honor-students. All schedules are subject to approval by the department as a body.

Course 199 is designated as an Honor-Course in Politics. It is open by special permission to students seeking honors, or other qualified students. The course consists primarily of extensive reading in politics and examination of actual government. Freedom of choice and effort is encouraged. A maximum credit of 4 units a half-year is offered. In addition, honor-students may, and preferably should, in the senior year take the graduate course in political theory.

The final test of the fitness of candidates for distinction takes the form of an oral examination in the last half of the senior year. Written work of each applicant, prepared at any time during the college course, is examined and the general knowledge of government, American and foreign, foreign relations, and political theory, is tested.

**LOWER DIVISION COURSES****1A. Government.****(REED)**

The government and parties of Great Britain, France, Italy, Belgium, and other countries having a parliamentary form of government.  
3 hrs., first half-year. M W F, 3.

**1B. Government.****(REED)**

The government and parties of Switzerland, Austria-Hungary, Germany and the United States.  
3 hrs., second half-year. M W F, 3.

\* Absent on leave for the duration of the war.



UPPER DIVISION MAJOR COURSES

101. Theory of the State. (ELLIOTT)  
 An introductory study of the fundamentals of politics.  
 2 hrs., first half-year. M W, 2.
102. American Political Institutions. (ELLIOTT)  
 A study of the origin and development of political institutions in the United States. Recommended for students whose major is political science and for students who intend to teach government in high schools.  
 2 hrs., second half-year. M W, 2.
- \*103. The Government of Dependencies. (BARROWS)  
 A brief general survey of modern colonial government, followed by more detailed study of one or more dependent possessions.  
 3 hrs., first half-year. M W F, 9.
- \*105. International Relations: Spanish America. (BARROWS)  
 Special attention is given to the government and politics of Mexico, Central America, and the Caribbean, and the relations of these regions with the United States.  
 3 hrs., first half-year. M W F, 9.
- \*106. International Relations: the Far East. (BARROWS)  
 Governments of China and Japan; interests and dependencies of European states; American policy in the Orient.  
 3 hrs., second half-year. M W F, 9.
- 110A. The Government of Cities. (REED)  
 The development and present status of the governmental organization and activities of German, French, British, and American cities.  
 3 hrs., first half-year. M W F, 2.
- 110B. Municipal Administration. (REED)  
 The principles and methods according to which cities perform their functions, especially in the United States.  
 3 hrs., second half-year. M W F, 2.
- \*112. State Government. (———)  
 The first half of the course is based on a study of the government of California. The second half is devoted to party organization and activities.  
 3 hrs., second half-year. M W F, 9.

\*Not to be given, 1918-19.

**\*115. The Principles and Law of Public Administration. (BARROWS)**

The development of public administration, especially in the United States; the organization of administrative departments, obligations of administrative officers, and the methods by which administrative action is reviewed and controlled.

2 hrs., first half-year. Tu Th, 9.

**\*116. The Public Law of Modern European States. (EHRlich)**

Theory and practice, sources, literature; kingship, state, sovereignty, rights of individuals, representative government, separation of powers, courts, federalism, administrative law, extent of state action, discretionary power, police.

3 hrs., first half-year, M W F, 3.

**\*117A-117B. History of European Political Institutions. (EHRlich)**

From the later Middle Ages until modern times. The ordinary prerequisite to course 117B is course 117A or course 117 (taken August-December, 1917).

2 hrs., throughout the year. Tu Th, 3.

**119. The Political Institutions of France. (EHRlich)**

History of kingship, representative institutions, administration, courts, social structure. Philosophy of the monarchy and of the Revolution. Government of the Third Republic. Modern tendencies in government and social development.

2 hrs., first half-year. Tu Th, 3. With the approval of the department of Romanic languages may be credited as major work in French.

**120. Government of Germany and Prussia. (EHRlich)**

Political institutions since 1870-71, with a review of the growth of Prussia since the Middle Ages. Federal organization and government of the Kingdom of Prussia, with references to other members of the confederation. Government of districts with non-German population.

2 hrs., second half-year. Tu Th, 3.

**121. Origin and Problems of the War. (EHRlich)**

Growth and policies of Prussia and Germany. The Hapsburg empire. Pan-Germanism in the nineteenth and twentieth centuries. Russia, Poland, and the Balkans on the eve of the war. The unredeemed nationalities. International law before and during the war. The war and America. Problems of world organization.

3 hrs., first half-year. M W F, 3.

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\*Not to be given, 1918-19.

**122. Government of the United Kingdom of Great Britain and Ireland.**  
(EHRlich)

**Law** and custom of the constitution. Administration. Judiciary. References to the government of the British Empire and of its component parts. Attention will be paid to war developments.

3 hrs., second half-year. M W F, 3.

**199A-199B. Honor-course.**

(The STAFF)

Throughout the year. Hours to be arranged.

### GRADUATE COURSES

The scope of instruction in this department includes modern governments, their administration and internal politics; international relations; the government of dependencies; state government and administration; local and municipal government in Europe and America; political theories; administrative and legislative methods and problems. Courses in public law are offered in the department of jurisprudence, and candidates for the doctor's degree who offer political science as a major are expected to take courses in Constitutional Law of the United States and International Law, with study of leading cases.

The department is prepared to direct advanced study and research in the following fields: Administrative development in state and municipal government in the western states of the Union; comparative American legislation; the government of the Mexican Republic; the government of American dependencies; international relations in the Pacific; the government of England.

The University Library is equipped for the study of the government and politics of Western Europe, the United States, and Spanish America. Its collections are being added to for the study of the Far East and the Pacific. The Bancroft Library contains extensive materials, which are being increased, for study of the institutions and politics of Spanish North America.

**201A. Political Science.**

(ELLIOTT)

A reading course in political writings: Plato's Republic; Aristotle's Politics; Macchiavelli's Prince; Hobbes' Leviathan; Locke's Essays on Government; Montesquieu's Spirit of the Laws; Rousseau's Social Contract.

3 hrs., first half-year. M W, 8:30-10 a.m.

**201B. Political Science.**

(ELLIOTT)

The reaction against the doctrines of the eighteenth century, as represented by the writings of De Maistre and Burke; Godwin's Political Justice; Bentham's A Fragment on Government, and Principles of Morals and Legislation; Austin's Province of Jurisprudence; Mill's Essays on Liberty and Representative Government; the social and political doctrines of August Comte; Bagehot's Physics and Politics; exponents of scientific anarchism and of state socialism; modern writers, chosen according to preference of the class.

3 hrs., second half-year. Tu Th, 8:30-10 a.m.

- \*204A-204B. Seminar in Foregin Relations. (BARROWS)  
2 hrs., throughout the year. Th, 2-4.
- \*205A-205B. Seminar in Administration. (BARROWS)  
The seminar as a body makes a study of federal, state, local and municipal administration with reference to California.  
2 hrs., throughout the year. Tu, 2-4.
- \*206. The Government of Mexico. (BARROWS)  
Investigation of federal, state, and municipal government, and of social and political conditions in the Mexican Republic. A knowledge of Spanish is prerequisite. Students who present doctor's theses in this field should expect to complete their study in Mexico.  
First half-year. Hours and credit to be arranged.
- \*207. The Government of the Philippines. (BARROWS)  
Investigation of the institutions of the Philippines under Spanish and American rule; the policies pursued; the development of the Filipino peoples under these influences. A knowledge of Spanish is required.  
Second half-year. Hours and credit to be arranged.
- 208A-208B. Municipal Government. (REED)  
Investigation of actual problems of municipal government with special reference to administration.  
2 hrs., throughout the year. W, 4-6.
- 209A-209B. Seminar in Public Law. (EHRlich)  
Weekly papers and theses. The subjects will be selected with particular reference to American and European war legislation, jurisprudence, and constitutional developments, and to problems of reconstruction.  
2 hrs., to be arranged. Credit, 2-4 units, according to amount and quality of work done.
- 210A-210B. Seminar in the History of European Political Institutions. (EHRlich)  
Weekly papers, and theses.  
2 hrs., to be arranged. Credit, 2-4 units, according to amount and quality of work done.

NOTE.—Courses 209 and 210 may be repeated without duplication of credit.

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\*Not to be given, 1918-19.

**PUBLIC HEALTH**

Instruction in the subjects which form the three curricula leading to the degree of Graduate in Public Health, as outlined in the Circular of Information, Academic Departments, is given in the departments listed below. For details regarding courses of instruction the student is referred to the announcements of the departments concerned, and to the Committee on Public Health Study-lists.

**DEPARTMENTS IN BERKELEY**

Agriculture (Entomology, Nutrition, Veterinary Science), Anatomy, Biochemistry and Pharmacology, Civil Engineering, Economics, Hygiene, Pathology and Bacteriology, Physiology, Political Science, and Zoology.

**DEPARTMENTS OF THE MEDICAL SCHOOL IN SAN FRANCISCO**

Clinical Neurology, Dermatology, Laryngology, Legal Medicine, Medicine, Ophthalmology, Orthopedic Surgery, Pediatrics, Surgery, and Urology.

**COMMITTEE ON PUBLIC HEALTH STUDY-LISTS**

LEGGE (chairman), F. W. LYNCH, R. P. MEADS, LANGELIER

## PUBLIC SPEAKING

MARTIN C. FLAHERTY, Ph.B., Associate Professor of Forensics.

CHARLES D. VON NEUMAYER, Assistant Professor of Public Speaking.

FLORENCE E. LUTZ, Lecturer in Voice Culture.

\*GEORGE BOAS, Ph.D., Instructor in Public Speaking.

ANNIE H. ALLEN, M.A., Instructor in Public Speaking.

DAVIS EDWARDS, A.B., Instructor in Public Speaking.

CAROL EBERTS, A.B., Teaching Fellow in Public Speaking.

MARY L. KLEINECKE, A.B., Teaching Fellow in Public Speaking.

*Honor-students in the Upper Division.*—Candidates should arrange their programmes so as to include in their upper division work 8 units in voice culture, 8 units in vocal interpretation, and 8 units in oral expository composition. In applying this rule the department stands ready to modify its provisions to meet exceptional cases. Candidates, for instance, who have been advanced to the honor-status in English will be permitted to offer a certain proportion of major units in that subject in partial satisfaction of the requirement in public speaking.

## LOWER DIVISION COURSES

- 1A-1B. Elements of Public Speaking. (FLAHERTY, EDWARDS, EBERTS)  
Training in fundamental processes; organization and arrangement of material; practice in speaking.  
3 hrs., throughout the year. Six sections: M W F, 8, 9, 10, 2, 3; Tu Th S, 9.
- 2A-2B. Elements of Expression and Interpretation. (LUTZ, ALLEN)  
A practical course in reading and speaking. Exercises to establish responsiveness of voice and body. For lower division students only.  
3 hrs., throughout the year. Two sections, limited to fifteen each: M W F, 9; Tu Th S, 9.
- 4A-4B. Vocal Expression. (VON NEUMAYER)  
Drill in elocution, reading, and the declamation of original addresses.  
2 hrs., throughout the year. Two sections: Tu Th, 9, 10.
- 5A-5B. Second Year Public Speaking. (EDWARDS, KLEINECKE)  
(A) The rhetoric of oral discourse: the definition and division terms, arrangement and sequence of topics; amplification by repetition, illustration, contrast, detail, etc.  
(B) Principles of argumentation: analysis of propositions, brief drawing, the nature and kinds of evidence.  
3 hrs., throughout the year. Three sections: M W F, 9, 10, 3.

\* Absent on leave for the duration of the war.

## 10A-10B. Dramatic Interpretation.

(VON NEUMAYER)

A course adapted to the needs of beginners and designed as a systematic introduction to more advanced dramatic work. It aims to cover the elements of acting: diction, poise, reading, pantomime, character portrayal, etc. Limited to twenty.

3 hrs., throughout the year. M, 1-3; W, 2.

## 20A-20B. The Use of the Library.

(FLAHERTY)

The course is designed to enable students to make more effective use of the library in the pursuit of their studies. It will be based upon practical exercises in the use of the more important library tools: the card catalogue, the unabridged dictionaries, encyclopedias, general and special year-books, general atlases, chronologies, aids to the choice of books, special bibliographies, etc.

3 hrs., either half-year. M W F, 10.

## UPPER DIVISION MAJOR COURSES

## 107A-107B. Reading and Speaking. (VON NEUMAYER, LUTZ, ALLEN)

Training in oral expression; a study of the fundamental principles of effective reading and speaking. Planned especially to meet the requirements of candidates for the teacher's recommendation. (See also 111A-112A.)

3 hrs., throughout the year. Three sections: M W F, 8, 9, 4.

## 109A-109B. The Cultivation of the Speaking Voice.

(ALLEN)

A scientific study of the laws governing voice production. The elimination of interference and fatigue. Diction, enunciation. Simple voice practice in short speeches and in reading.

3 hrs., throughout the year. Tu Th S, 9.

## 110A-110B. Third Year Public Speaking.

(FLAHERTY, KLEINECKE)

(A) Oral Argumentation and Debate. Preparation of briefs; presentation of arguments.

3 hrs., first half-year. Two sections: I, Th, 3-5; II, W, 3-5; third hour by appointment for supervision of briefs and bibliographies. Prerequisite: course 5A-5B and some preliminary training in vocal expression.

(B) Practice in Extempore Speaking; the Preparation of the Occasional Address.

3 hrs., second half-year. Two sections: W, 3-5; Th, 3-5; third hour by appointment. Open to students selected from 110A. Students are advised to follow this course with English 121E-121F, Oral Debates on Literary Topics.

## 111A-111B. Expression and Interpretation.

(LUTZ, ALLEN)

The material of course 2A-2B adapted to the needs of upper division students who have had no previous training in expression. Two sections, limited to twenty each.

• 3 hrs., throughout the year. M W F, 10; Tu Th S, 10.

- 112A-112B. Short Talks on Current Topics. (EDWARDS)  
 A practical course in public speaking aimed to meet the needs of business men and prospective teachers.  
 3 hrs., throughout the year. Tu Th S, 10.
- 114A-114B. Vocal Interpretation. (ALLEN)  
 A course in oral reading based upon selections from the Bible, Browning, Tennyson, Emerson, and Carlyle.  
 2 hrs., throughout the year. Tu Th, 10. Prerequisite: 2A-2B or its equivalent.
- 116A-116B. Advanced training for qualified students who are preparing for public platform work. (LUTZ)  
 3 hrs., throughout the year. M W F, 3.
- 117A. Extemporaneous Discourse. (—)  
 Exercises in the presentation of extemporaneous speeches on specific questions drawn from a familiar central topic. Training in structure and delivery. Class limited to fifteen.  
 2 hrs., first half-year. Th, 3-5.
- 118A-118B. Acting as an Art and as a Method of Interpretation. (VON NEUMAYER)  
 The psychology of acting; the cultivation and development of the dramatic instinct through character portrayal. Study and presentation of selected one-act plays. Open to students who have the permission of the instructor.  
 3 hrs., throughout the year. Sec. I, M, 10-12, W, 10; Sec. II, Th, 7-9 p.m., and a third hour to be arranged.

## GRADUATE COURSES

- 210A-210B. Practical Bibliography. (FLAHERTY)  
 Designed to meet the needs of prospective teachers of debating.  
 2 hrs., throughout the year. Alt. F, 11, and a second hour to be arranged.
- 220A-220B. Expression and Interpretation: A Course for Teachers. (ALLEN, LUTZ)  
 A review and discussion of methods, with special reports and criticisms of text-books.  
 2 hrs., throughout the year, to be arranged.



# ROMANIC LANGUAGES

RUDOLPH SCHEVILL, Ph.D., Professor of Spanish.

GILBERT CHINAID, L. ès L., Professor of French.

ALBERT J. CARNOY, Ph.D., LL.D., Professor of Romanic Philology.

\*GUSTAVE FAUCHEUX, B. ès L., B. ès Sc., Associate Professor of French Literature.

RAMON JAÉN, LL.D., Associate Professor of Spanish.

JOHN T. CLARK, Ph.D., Assistant Professor of Romanic Philology.

\*CARLOS BRANSBY, M.A., Litt.D., Assistant Professor of Spanish.

PERCIVAL B. FAY, Ph.D., Assistant Professor of Romanic Philology.

†LESLIE M. TURNER, D. ès L., Assistant Professor of French.

S. GRISWOLD MORLEY, Ph.D., Assistant Professor of Spanish.

‡ALFRED SOLOMON, M.A., Instructor in French.

CAROLINE B. SINGLETON, M.A., Instructor in French.

WILLIAM GIRARD, Ph.D., Instructor in French.

JOHN A. MAGNI, Ph.D., Instructor in French.

FORREST E. SPENCER, M.A., Instructor in Spanish.

ELIZABETH MCGUIRE, M.A., Instructor in Spanish.

MALBONE W. GRAHAM, D.D., Instructor in Spanish.

LOUIS BARNIER, B. ès L., Instructor in French.

NEMOURS HONORÉ CLEMENT, M.A., Instructor in French.

BEATRICE Q. CORNISH, M.A., Assistant in Spanish.

EUGENE JORALEMON, A.B., Assistant in Romanic Languages.

No student will be permitted to begin more than one Romanic language in any one half-year.

*Honor-students in the Upper Division.*—No student will be admitted to candidacy who has not creditably completed all the lower division courses in his proposed major subject, or the equivalent of these courses. The candidate's record for each half-year must include at least sixty per cent of first and second grades in all courses, and work done in the department of Romanic languages must be first-grade work. The candidate must furthermore give evidence of real linguistic ability. Honor-students will be under the immediate supervision of a special committee appointed by the department. Each instructor will devote special attention to the honor-candidates who are in his courses, and direct their work along lines of general reading in connection with their major subject. Candidates will be encouraged to make extensive use of the library facilities.

The 24 units of upper division work which is controlled by the department must ordinarily include some courses in a Romanic language other

\* Absent on leave, 1918-19; † in residence second half-year only; ‡ absent on leave for the duration of the war.

than that of the major subject. Particular stress will be laid upon advanced composition and the elements of historical grammar. In addition to work done in courses, the candidates will be required to pass a final oral or written examination, in which they must demonstrate a reasonable acquaintance with the literature and historical background of their major subject, an exact knowledge of the grammar, and an ability to express themselves clearly in the language of the major subject.

#### **FRENCH**

For detailed description of courses see pages 108-111.

#### **SPANISH**

For detailed description of courses see pages 255-257.

#### **ITALIAN**

For detailed description of courses see page 155.

#### **GRADUATE COURSES**

Students who enter the graduate division with the purpose of taking an advanced degree in the department of Romanic languages should have a good reading knowledge of Latin and German. They are also requested to attend the following course:

Romanic Seminar. A review of the most recent books bearing on the Romanic languages and literatures.

1 hr., fortnightly. F, 11 (alternating with the University meetings).

**SANSKRIT**

ARTHUR W. RYDER, Ph.D., Assistant Professor of Sanskrit.

**SANSKRIT LITERATURE—FREE ELECTIVE COURSES**

The following courses do not require a knowledge of any Indian language, and are open to all students of the upper division. Together, they aim to give an outline history of Sanskrit literature, but any one of them may be taken independently.

20. The Veda and the Philosophical Systems. (RYDER)  
Lectures and reading. An outline of Vedic literature; the earlier forms of Brahmanism; the development of ritualism and philosophy; the revolt which found expression in Buddhism and Jainism, the struggle between Brahmanism and Buddhism, and the rise of Hinduism.  
2 hrs., first half-year. Tu Th, 11.
21. Classical Sanskrit Literature. (RYDER)  
Lectures and reading. Outline of the great epics and of the classical literature, exclusive of the drama: The Mahābhārata the Rāmāyana; the Kāvya's (minor epics); lyric and elegaic poetry; novels and romances; fables and epigrams; the law books; rhetoric and poetics; scientific literature.  
2 hrs., second half-year. Tu Th, 11.

**UPPER DIVISION MAJOR COURSES**

- 101A-101B. Elementary Sanskrit. (RYDER)  
Perry's Primer, Whitney's Grammar, Lanman's Reader. Grammar, composition, and reading.  
3 hrs., throughout the year. M W, 11, and a third hour to be arranged.
- 102A-102B. Second-year Sanskrit. (RYDER)  
Rapid reading of classical texts: the fables of the Hitopadeṣa, selections from the Kathāsaritsāgara and Daṣakumāracarita.  
3 hrs., throughout the year, to be arranged.
- 103A-103B. Advanced Classical Sanskrit. (RYDER)  
(A) Reading of more difficult texts and study of their position in the literature: the Epigrams of Bhartrihari; the Meghadūta of Kālidāsa. (B) Introduction to the drama and to the Prākṛit languages: the Ākuntalā of Kālidāsa; the Mricchakatika of Cūdraka.  
3 hrs., throughout the year, to be arranged.

The reading matter of courses 102A-102B and 103A-103B may be varied in accordance with the tastes and purposes of the students.

**GRADUATE COURSE**

220. The Veda and the Philosophical Systems. (RYDER)  
An expansion of course 20 with added reading and the preparation of a thesis.  
2 hrs., first half-year; 4 units. Tu Th, 11.

## SEMITIC LANGUAGES

WILLIAM POPPER, Ph.D., Associate Professor of Semitic Languages.

\*MARTIN A. MEYER, Ph.D., Lecturer in Semitic Literature and History.

*Language Courses*

The specific courses given in any year, the hours therefor, and the authors read, will depend upon the needs of the students. All courses except elementary courses may be repeated without duplication of credit and by agreement may be counted as graduate work; all are year-courses, and open to any properly qualified student; excepting course 107A-107B, they will be given by Mr. Popper.

Hebrew. Elementary (3A 3B, 3 hrs.); Second Year (104A-104B, 2 hrs.); Exegetical (206A-206B, 2 hrs.); †Mishnaic (107A-107B, 1 hr., Tu, 1, Dr. Meyer); Medieval (207A-207B, 2 hrs.).

Arabic Elementary (113A-113B, 2 hrs.); Prose (214A-214B, 2 hrs.); Koran and Poetry (215A-215B, 2 hrs.).

Syriac. Elementary (111A-111B, 2 hrs.); Advanced (212A-212B, 2 hrs.). Seminar (220A-220B, 2 hrs.).

*Lecture Courses*

Free elective courses not requiring a knowledge of any Semitic language.

†7A-7B. History of the Hebrew Religion. (MEYER)  
1 hr., throughout the year. Tu, 1.

†8A-8B. The Second Hebrew Commonwealth. (MEYER)  
The history and literature of the Hebrews in Palestine after the return from the captivity (536 B.C.).  
1 hr., throughout the year. Tu, 2.

†9A-9B. The Diaspora. (MEYER)  
The life and letters of the Jews after the fall of Jerusalem (70-1492 A.D.).  
1 hr., throughout the year. Tu, 3.

†10A-10B. Modern Jewish History. (MEYER)  
1 hr., throughout the year. Tu, 4.

25. Mohammedanism. (POPPER)  
2 hrs., either half-year; 1 unit. Tu Th, 11.

\* Absent on leave, 1918-19.

† Not to be given, 1918-19.

# SLAVIC LANGUAGES

GEORGE R. NOYES, Ph.D., Associate Professor of Slavic Languages.

ALEXANDER S. KAUN, Ph.B., Assistant in Russian.

MILUTIN KRUNICH, Assistant in Serbo-Croatian.

*Honor-students in the Upper Division.*—Candidates for honors must do 24 units of upper division work in the department, of which at least 16 must be of first grade. The 24 units must include at least 18 units of work in one Slavic language and also either course 160, course 162 or (with the approval of the department), course 199.

## LOWER DIVISION COURSES

1A-1B. Elementary Russian. (NOYES)  
Bondar, Simplified Russian Method. Boyer and Speranski, Russian Reader. Practice in conversation.  
3 hrs., throughout the year. M W F, 1.

6A-6B. Elementary Polish. (NOYES)  
Baluta, Practical Handbook of the Polish Language. Reading of easy Polish texts.  
3 hrs., throughout the year, to be arranged.

10A-10B. Elementary Serbo-Croatian. (KRUNICH)  
Petrovitch, Servian Conversation-Grammar. Reading of easy texts.  
3 hrs., throughout the year. Tu Th F, 1.

15A-15B. Elementary Bohemian. (KAUN)  
Jonas, Bohemian Made Easy. Beneš, Česká čítanka.  
3 hrs., throughout the year, to be arranged.

By special arrangement with the Department, any one of the above four courses, with assigned readings in the history of Slavic literature, may be counted as work of the upper division. In such cases the student should register for course 101A, 106A and the like, instead of in course 1A, 6A, etc.

18. Russian Conversation. (KAUN)  
Practice in elementary Russian conversation and composition.  
2 hrs., first half-year; 1 unit. Tu Th, 1. Open only to those who are taking or have taken Russian 1A; not open to students entering the University from schools in the Russian Republic.

## FREE ELECTIVE COURSES

The following courses do not require a knowledge of any language other than English, and are open to all students of the upper division. By special arrangement with the instructor, they may be taken as major courses. In such cases the students should register in courses 120, 121, 122, or 140.

## 20. Russian Novelists and Dramatists of the Nineteenth Century.

(NOYES)

Lectures and reading. Authors: especially Tolstoy; also Pushkin, Gogol, Turgenev, Dostoyevsky, Ostrovsky, and others.

3 hrs., first half-year. M W F, 3. Not open to freshmen.

## 21. Recent Russian Literature.

(KAUN)

A study of important Russian writers later than Tolstoy: Chekhov, Korolenko, Merezhkovsky, Gorky, Andreyev, and others.

2 hrs., second half-year. Tu Th, 10. Not open to freshmen.

## 22. Slavic Literature.

(NOYES)

Lectures and reading. A brief account of the literature and folklore of Poland, Bohemia, and Servia.

3 hrs., second half-year. M W F, 3. Not open to freshmen.

## 40. The Political Development of Modern Russia.

(KAUN)

A study of political and social movements and institutions in Russia from about 1800 to the present day. Special attention will be paid to the history of Russian revolutionary movements since 1861.

2 hrs., first half-year. Tu Th, 10. Not open to freshmen.

## UPPER DIVISION MAJOR COURSES

## 102B. Second-year Russian.

(KAUN)

Turgenev, Mumu. Practice in conversation and composition.

2 hrs., second half-year. Tu Th, 1.

## 102A. Second-year Russian.

(KAUN)

Continuation of Russia 102B. Chekhov, Stories; Turgenev, Mumu; Lermontov, Bela. Forbes, Russian Grammar. Practice in conversation and composition.

3 hrs., first half-year. Tu Th, 11, and a third hour.

## 103B. Third-year Russian.

(KAUN)

Continuation of Russia 102A. Reading of modern prose and poetry.

3 hrs., second half-year. Tu Th, 11, and a third hour.

- 104A-104B. Fourth-year Russian. (KAUN)  
Reading of modern Russian texts. Practice in conversation and composition.

2 hrs., throughout the year, to be arranged.

- 111A-111B. Second-year Serbo-Croatian. (KRUNICH)  
Reading of *Boj na Kosovu* and *Hrvatsko kolo*, vol. 5. Practice in conversation and composition.

3 hrs., throughout the year. Tu Th F, 2.

- 116A-116B. Second-year Bohemian. (KAUN)

Reading of *Truhlár*, *Výbor z literatury české*.

3 hrs., throughout the year, to be arranged.

117. Written Translation from Russian. (NOYES)

Practice in written translation of Ostrovsky's dramas, with attention to English style.

1 or 2 units, either half-year; hours to be arranged. This course may be taken only in connection with other upper-division work in Russian.

- 119A-119B. Russian Composition. (KAUN)

Exercises in translation from English into Russian and in original composition in Russian. Practice in conversation.

1 hr., throughout the year, to be arranged.

HONOR-COURSES IN SLAVIC LITERATURE

160. The Life and Work of Leo Tolstoy. (NOYES)

Special assignments in connection with the work of course 20.

3 hrs., first half-year; 5 units. M W F, 3.

162. Polish Romanticism. (NOYES)

Special assignments in connection with the work of course 22.

3 hrs., second half-year; 5 units. M W F, 3.

- 199A-199B. Individual Work. (NOYES)

Candidates for honors and graduate students will be offered opportunities for independent reading and study. Credit will not exceed four units a half-year.

## GRADUATE COURSES

The University library offers ample material for advanced study of Russian literature and philology, and for the comparative study of the Slavic languages.

## 207A-207B. Polish.

(NOYES)

Reading of Mickiewicz and other Polish poets. Practice in written translation.

3 hrs., throughout the year, to be arranged.

## 231A. Old Church Slavic. Seminar.

(NOYES)

Leskien, *Handbuch der altpulgarischen Sprache and Grammatik der altpulgarischen Sprache*. Study of the relations of Old Church Slavic to the other Indo-European languages.

3 hrs., first half-year, to be arranged.

## 232B. Historical Russian Grammar. Seminar.

(NOYES)

Reading of Buslayev, *Russkaya hrestomatiya*. Study of the development of the Russian language and of its relations to the other Slavic languages.

3 hrs., second half-year, to be arranged. Prerequisite: course 231A.

## 299A-299B. Individual Work.

(NOYES)

Graduate students will be offered opportunities for independent reading and study. Credit will not exceed 4 units a half-year.



**SPANISH**

**RUDOLPH SCHEVILL**, Ph.D., Professor of Spanish.

**RAMON JAÉN**, LL.D., Associate Professor of Spanish.

**\*CARLOS BRANSBY**, M.A., Litt.D., Assistant Professor of Spanish.

**S. GRISWOLD MORLEY**, Ph.D., Assistant Professor of Spanish.

**FORREST E. SPENCER**, M.A., Instructor in Spanish.

**ELIZABETH MCGUIRE**, M.A., Instructor in Spanish.

**MALBONE W. GRAHAM**, D.D., Instructor in Spanish.

**BEATRICE Q. CORNISH**, M.A., Assistant in Spanish.

**AB. Elementary Spanish.**

(MCGUIRE, SPENCER, GRAHAM, CORNISH, and Assistants)

Stress is laid on accurate pronunciation, Castilian being the standard, on the essentials of grammar, and on careful translation into idiomatic English of simple Spanish prose. The equivalent of matriculation subject 15c<sup>1</sup>.

5 hrs., either half-year. First half-year: M Tu W Th F, 8, 9, 10, 1, 2; second half-year: M Tu W Th F, 8, 1, 2.

**CD. Elementary Spanish (Continuation of AB.)**

(MCGUIRE, SPENCER, GRAHAM, CORNISH and Assistants)

Further study of grammar, especially syntax. Reading of contemporary Spanish prose, plays and some verse. Conversation and composition. The equivalent of matriculation subject 15c<sup>1</sup>.

5 hrs., either half-year. First half-year: M Tu W Th F, 8, 9, 1, 2; second half-year: M Tu W Th F, 8, 9, 10, 1, 2. Students will continue under the same instructor and in the same section as in AB. Changes in section may be made only by permission of the head of the department.

**E-F. Intermediate Spanish.**

(MORLEY, JAÉN, and MCGUIRE)

A detailed study of syntax, dictation and memorizing of prose and verse; conversation; selections from modern texts. The equivalent of matriculation subject 15c<sup>1</sup>. Conducted chiefly in Spanish.

3 hrs., throughout the year. M W F, 8, 9, 1, 2. Prerequisite: courses AB, CD, or credit for matriculation subject 15c<sup>1</sup> or its equivalent, or a special examination.

**EF. Intermediate Spanish (continuation of CD of first half-year). Syntax, conversation, and rapid reading.**

5 hrs., second half-year. M Tu W Th F, 8, 1, 2.

\*Not to be given, 1918-19; given in alternate years.

## UPPER DIVISION MAJOR COURSES

## A. PRIMARILY FOR JUNIORS

## 103A-103B. The Nineteenth Century.

(MORLEY)

An outline of Spanish literature in the nineteenth century, with lectures and reading of representative authors. Limited to forty students, admitted by special permission of instructor only.

3 hrs., throughout the year. M W F, 10. Prerequisite: course E-F, or credit for matriculation subject 15c, or its equivalent, or a special examination.

## B. FOR JUNIORS AND SENIORS

## 105A-105B. The Modern Drama.

(SCHEVILL and MORLEY.)

A study of the chief plays of the most recent playwrights: Echegaray, Benavente, Galdós, the Quintero brothers, etc. Conducted mainly in Spanish.

2 hrs., throughout the year. Two sections: I, Tu Th, 9; II, Tu Th, 10. Limited to thirty students in a section, admitted by special permission of the instructor.

## 106A-106B. Conversation and Composition.

(JAÉN and SPENCER)

Advanced written and oral expression.

3 hrs., throughout the year. M W F, 8, 9, 10.

## C. PRIMARILY FOR SENIORS

## 107A-107B. A Survey of Spanish Literature.

(SCHEVILL)

A study of the principal writers with selections from their most important works; lectures; reports to be made by the students on work assigned. Students are admitted only by special permission of instructor. Both 107A and 107B are required of candidates for the teacher's recommendation with Spanish as a major.

3 hrs., throughout the year. M F, 9 consultation, Tu, 11.

## 108A-108B. Spanish National Novel.

(JAÉN)

First half-year, B. Pérez Galdós; second half-year, Pío Baroja.

3 hrs., throughout the year. M W F, 2.

## 129. Special Study.

(SCHEVILL)

For students who wish to undertake special advanced work and to learn how to use the library.

First half-year. By appointment.

136A-136B. Required for the teacher's recommendation. See course 136 above under French.

Attention is directed to French 132A-132B.

## 140A-140B. A General Introduction to the History of Speech. (CARNOY)

For all students who specialize in languages.

2 hrs., throughout the year. M W, 11.

## GRADUATE COURSES

- 201A. Literary Investigation. (SCHEVILL)  
2 hrs., first half-year, M F, 10.
- 203A-203B. Cervantes. (SCHEVILL)  
2 hrs., throughout the year. Tu Th, 10.
- \*205A-205B. Masterpieces of the Sixteenth and Seventeenth Centuries. (SCHEVILL)  
2 hrs., throughout the year. W F, 5.
- 208B. The Spanish Ballad. (MORLEY)  
1 hr., second half-year, to be arranged. Given in alternate years.
- 229A. Special Advanced Study. (SCHEVILL)  
Hours and credit to be arranged.  
Attention is called to German 208A-208B (Spanish Influences upon  
German Literature in the Seventeenth and Eighteenth Centuries.)  
Attention is directed to French 220A-220B, above.

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\* Not to be given, 1918-19.

**ZOOLOGY**

<sup>3</sup>CHARLES A. KOFOID, Ph.D., Sc.D., Professor of Zoology, and Assistant Director of the Scripps Institution for Biological Research.

WILLIAM E. RITTER, Ph.D., Professor of Zoology and Scientific Director of the Scripps Institution for Biological Research.

JOHN C. MERRIAM, Ph.D., Professor of Palaeontology and Historical Geology.

SAMUEL J. HOLMES, Ph.D., Professor of Zoology.

J. FRANK DANIEL, Ph.D., Associate Professor of Zoology.

JOSEPH GRINNELL, Ph.D., Associate Professor of Zoology and Director of the California Museum of Vertebrate Zoology.

JOSEPH A. LONG, Ph.D., Assistant Professor of Embryology.

WILLIAM W. CORT, Ph.D., Assistant Professor of Zoology.

<sup>3</sup>ALBERT L. BARROWS, Ph.D., Instructor in Zoology.

HAROLD C. BRYANT, Ph.D., Economic Ornithologist, California Museum of Vertebrate Zoology.

CHARLES V. TAYLOR, M.A., Instructor in Protozoology.

ROFENA LEWIS, A.B., Teaching Fellow.

REGINA WOODRUFF, A.B., Teaching Fellow.

MARGARET MANN, A.B., Teaching Fellow.

DONALD L. AUGUSTINE, B.S., Teaching Fellow.

HARVEY H. NININGER, M.A., Teaching Fellow.

MYRIAM C. GARRETT, A.B., Teaching Fellow.

FLORENCE ALSOP, A.B., Teaching Fellow.

The courses are designed to meet the needs of various classes of students. For certain specific ends the following recommendations are made:

(1) Students who plan to specialize in zoology should complete courses 1A and 1B as early in their course as is feasible. These courses are prerequisite to major work, and, except as noted below, to all courses in the department. The following grouping of courses is recommended: (I) 106 or 107 or 103, 103c and 108; (II) 110, 110c and 111, 111c; (III) 114 and 115; (IV) 112 and 113.

(2) For general students, courses 1A, 1B, 10, 103, 103c, 104, 107, 108, 109, 110, 110c, 111, 111c, 112, 113, 114, 115, and 20.

(3) For students planning to study medicine, courses 1A, 1B, 4, 103, 103c, 106, 107, 108, 110, 110c, 111, 111c, 114, 115.

(4) For non-biological students, courses 10, 20, 104, 114, and 115.

<sup>3</sup> Absent on leave for the duration of the war.

Students who plan to enter instruction or research in zoology as a profession should not only lay a broad foundation in the courses in zoology but should also include at least the fundamental courses in chemistry and physics in their course of study. Courses in botany, physiology, palaeontology, and entomology may be included to advantage, and a reading knowledge of German and French is essential. Research in biometrics requires a knowledge of higher mathematics (Mathematics 120) and statistical methods (Economics 140).

Students who intend to do advanced work in zoology should take the Subject B examination in German, French or Latin.

*Honor-students in the Upper Division.*—To honor-students whose major is zoology the department offers closer supervision of their work, larger facilities in material and equipment, and wider latitude in selection of subject-matter. Its purpose is to foster initiative and independent effort. Honor-students may select a member of the staff as adviser. Guidance in a selected course of reading will be afforded. A major in zoology should include any two of the groups of courses listed under (1) above. The remainder of the 24 major units may include any major courses in zoology. Major courses in allied natural sciences will be accepted to the extent of 8 units when approved by the department.

#### LOWER DIVISION COURSES

##### 1A. General Zoology. (HOLMES, DANIEL, LONG, CORT, and Assistants)

An introduction to the facts and principles of animal biology, with special reference to the structure, functions, and evolution of animal life.

Lectures, 2 hrs., laboratory, 4 hrs., first half-year; 4 units. Lectures, Tu Th, 10; laboratory sections: I, M F, 1-3; II, Tu Th, 1-3; III, W, 1-3, S, 9-11 or 10-12.

The laboratory exercises are essentially illustrative of lectures and are based on the examination of living and prepared specimens, supplemented by models and charts. Mr. Cort in charge.

##### 1B. General Zoology. (DANIEL and Assistants)

A continuation of course 1A. The behavior, structure, and development of animal types, with special reference to the lower vertebrates.

6 hrs., second half-year 4 units. Lectures, Tu Th, 10; laboratory, three sections: I, Tu Th, 8-10; II, Tu Th, 1-3; III, W, 1-3, S, 9-11. Prerequisite: course 1A.

##### 4. Microscopical Technique. (LONG)

Preparation of animal tissues for microscopical examination; use of microscope and microtome; methods of fixation, sectioning, and staining. Laboratory and reading.

3 hrs., second half-year; 1 unit. W, 8-11. Prerequisite: course 1A and elementary chemistry.

## 10. General Biology.

(HOLMES)

An outline of the main facts and principles of animal biology with special reference to evolution, heredity, eugenics, and the bearing of biology upon human life. Lectures with demonstrations, conferences, assigned readings, and reports.

3 hrs., second half-year. Lectures, Tu Th, 8. Conferences, four sections: I, Th, 9; II, F, 8; III, F, 9; IV, S, 9. Open without prerequisite to all students, but designed primarily for those not specializing in zoology.

## FREE ELECTIVE COURSE

## 20. Some Ethical and Educational Problems Viewed Biologically.

(BITTER)

The course consists in an effort to apply the biological conception of "organismal integrity" or the "organism as a whole," to some of the central questions with which men under modern civilization are struggling.

2 hrs., second half-year, after March 1; 1 unit. Tu Th, 4. Registration may be made with Mr. Holmes, 214 East Hall. Open to the public.

## UPPER DIVISION MAJOR COURSES

## 103. Experimental Zoology.

(DANIEL)

An experimental study of the fundamental properties of living substance, including its development, its growth and regeneration, and an application of the transplantation of living tissues.

2 hrs., first half-year. W F, 9. Prerequisite: courses 1A and 1B.

## 103c. Experimental Zoology.

(DANIEL)

Laboratory experiments correlated with the lectures of course 103.

6 hrs., second half-year; 2 units. M W, 1-3, and two other hours. Prerequisite: course 103.

## 104. Animal Behavior.

(HOLMES)

The tropisms, instincts, and intelligence of animals, and the general evolution of the animal mind.

2 hrs., first half-year. Tu Th, 4.

## 106. Comparative Anatomy of the Higher Vertebrates.

(MERRIAM, DANIEL, and Assistant)

Comparative osteology (under Merriam), dissection of a reptile, a bird, and a mammal, and lectures and recitations on the organology of vertebrates.

8 hrs., first half-year; 4 units. Lectures and recitations, Tu Th, 4. Laboratory, section I, M F, 1-4; II, Tu Th, 1-4. Prerequisite: courses 1A and 1B. Students in Zoology 106 may take the lectures of Palaeontology 104 without the laboratory work (1 unit).

## 107. Cytology.

(LONG)

Structure, activities, and chemistry of the cell; cell-division, maturation of the sex cells, fertilization, parthenogenesis, and cleavage; relation of cytological phenomena to normal and abnormal growth, to differentiation, to sex, and to theories of heredity and evolution.

8 hrs., first half-year; 4 units. Lectures, Tu Th, 9; laboratory, Tu Th, 1-4. Prerequisite: course 1A.

## 108. Embryology.

(LONG)

The phenomena of animal development, fundamental facts of reproduction, comparative embryology and organogeny of the higher vertebrates. Lectures, reading, and laboratory.

8 hrs., second half-year; 4 units. Lectures, Tu Th, 9; laboratory, two sections: I, Tu Th, 8-9, 10-12; II, Tu Th, 1-4. Prerequisite: courses 1A and 1B.

## \*109. Biology of Water.

(KOROID and BARROWS)

Biological problems of the microscopic life of fresh water and of the sea from the distributional, ecological, and experimental standpoints. Laboratory, field work, and thesis.

6 hrs., second half-year; 2 units. W F, 1-4. Prerequisite: course 1A.

## \*109c. Biological Examination of Water.

(———)

The biology of waters of reservoirs and streams, with special reference to water supply and sewage disposal. A field and laboratory course dealing with the microscopic organisms of fresh water, other than bacteria, their occurrence, distribution, and control, and their relation to problems of sanitary engineering.

3 hrs., second half-year; 1 unit. F, 1-4. Prescribed, in the third year of the sanitary course, College of Civil Engineering. Open to students of household science.

## 110. Protozoology.

(TAYLOR)

Structure, life-history, and ecology of the protozoa with reference to the problems of biology; the relations of protozoa to disease in man and other animals. Reports on assigned topics.

2 hrs., first half-year; W F, 8. Prerequisite: course 1A. Students in public health and veterinary science with adequate biological training will also be admitted.

## 110c. Protozoology Laboratory.

(TAYLOR)

3 or 6 hrs., first half-year; 1 or 2 units. W F, 1-4. Prerequisite: course 1A; course 110 should be taken concurrently.

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\* Not to be given, 1918-19.

111. General Parasitology. (CORT)  
A general discussion of the relations of animals to the causation and transmission of disease, with special reference to the animal parasites of man and the domesticated animals; methods of biological prevention and control. Lectures and reports on assigned topics.  
2 hrs., second half-year. W F, 8. Prerequisite: course 1A. Students of public health, and household, or veterinary science who have had adequate biological training will also be admitted.
- 111c. The Morphology and Life-history of Animal Parasites. (CORT)  
3 or 6 hrs., laboratory, second half-year; 1 or 2 units. W F, 1-4. Prerequisite: course 1A. Course 111 should be taken concurrently.
- \*112. Invertebrate Zoology. (LONG)  
The morphology, habitats, habits, and life-histories of the invertebrates, with special reference to local fauna, both marine and fresh-water. Lectures, readings, reports, and laboratory and field work.  
7 hrs., second half-year; 3 units. Lectures, W, 9; laboratory, 6 hrs. to be arranged. Prerequisite: course 1A.
113. Vertebrate Zoology. (GRINNELL and BRYANT)  
A faunal and economic study of the birds, mammals, and reptiles of California, including a brief treatment of the amphibians and fishes. Lectures, field, laboratory, and museum work, with papers on assigned topics.  
7 hrs., second half-year; 3 units. Th, 1-4; S, 8-12. Prerequisite: course 1A. Courses 1B and 106 are also recommended.
114. Heredity and Evolution. (HOLMES)  
A discussion of the facts of heredity; Mendel's law and its applications; the development of theories of evolution since Darwin. Lectures and reports on assigned topics.  
3 hrs., first half-year. M W F, 10.
115. Eugenics. (HOLMES)  
A consideration of topics in human heredity and eugenics. Lectures, assigned reading and reports.  
2 hrs., second half-year. Tu Th, 11. Prerequisite: course 114 or its equivalent.
- 117A-117B. Special Undergraduate Study. (The STAFF)  
All work supplementary to courses above. Credit to be fixed in each case.
- 118A-118B. Advanced Undergraduate Work in Special Topics. (The STAFF)  
Hours to be arranged.

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\* Not to be given, 1918-19.



## 119. Special Work.

(The STAFF)

Work on assigned topics carried on in Berkeley when the University is not in session, or in the field, or at the seashore under the direction of a member of the staff. Credit, 2-6 units.

## GRADUATE COURSES

## 221A-221B. Seminar. Development of Biological Thought in the Nineteenth Century.

(HOLMES)

2 hrs., throughout the year; 1 unit each half-year. W, 4-6.

## 222A-222B. Journal Club.

(The STAFF)

The instructors and advanced students hold weekly meetings, at which reports are made on the research work of members of the staff, and on important current papers, followed by informal discussions. Students who wish to become active members should consult Mr. Daniel.

1 hr., throughout the year; no credit. W, 11.

## 223. Teachers' Course.

(HOLMES)

Aims, methods, and subject matter of zoological instruction in the schools.

1 hr., first half-year, M, 11.

## \*240. Seminar in Protozoology.

(—)

2 hrs., second half-year; 1 unit. Th, 4-6.

## 224A-224B. Research.

(The STAFF)

Original study on special topics, in the field, laboratory, and museum. The work may be carried on in the laboratories at Berkeley or at the San Diego station at any season of the year.

Hours to be arranged.

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\* Not to be given, 1918-19.

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